

INDEXED 215.  
*Cochran (S.)*

# QUESTIONS

ON

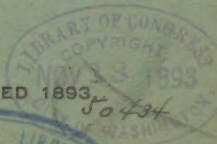
## KIRKE'S

# PHYSIOLOGY

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BY

SAM. COCHRAN, M. D.

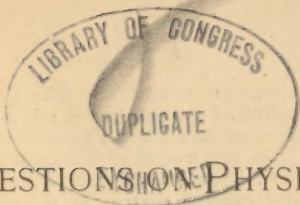
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## QUESTIONS ON PHYSIOLOGY.

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What does physiology mean; Of what does it treat; What are vital phenomena; What is a protoplasm; How has dissection shown the body to be constructed; Of what are each of these composed; What is embryology; What does it teach; Size; Shape; What find in it; Name; What do cells exhibit; What is the foundation of physiology; Give old definition of cell; Part of cell is of prime importance; Give Huxley's definition of cell; Define a cell; Through what does each cell go; Origin of a cell; Give properties of protoplasm; Appearance under the microscope; What is Brownian movement; What are vacuoles; In what cells most numerous; Give composition of protoplasm; What are proteids; Composition; What is essential to the composition of the protoplasm; What other bodies are frequently present; Composition; What are carbohydrates; Name other things found in cell; What is chlorophyll; Composition of fats; What is lecithin; In what can we study vital characteristics of protoplasm; Where found; Describe the movement; What is amœboid movement; Streaming movement; Gliding movement; Name the movements of vegetable cells and describe each; What will increase the movement of the amœba; Kind temperature; Give example of mechanical stimuli; Nerve influence; Chemical stimuli; Kind atmosphere will suspend it; Cause it to resume; How influenced by electricity; Describe the digestion of the amœba; How does it excrete; Does it respire; What is metabolism; How many kinds of changes and what are they; What is anabolism; Katabolism; In the direction of anabolism,

name the two changes which take place; In what does the katabolism of the cell consist; What would increase it; Of what nature is it; In what does this result; When does the weight of the animal remain stationary; Grow; Decay; Is growth confined to living beings; Give example; Describe the growth of salt; Living structure; Kind structure subject to decay; How do these changes occur; Are lifeless structures subject to the same laws; Kind structure is an oyster shell; From what formed; How; Does crystal of salt change in composition; What structure does; Does amœba reproduce; From what does every cell descend; What is gemmation; Fission; Name the parts that make up the structure of a cell; Which best developed in young cells; Give names of the meshwork; The fluid; Give properties of reticulum; Does it vary; Is it always present; Reason for thinking the hyaloplasm is contractile; What are nuclei; What does nucleus mean; Nucleolus; How do histologists recognize nuclei; Give structure of nuclei; What is chromoplasm; Achromatin; Nuclea matrix; Describe it; Give difference between animal and vegetable cell; Difference in function; What do vegetable cells receive from air; Soil; Out of these what is formed; What is chlorophyll; What takes place in plants containing chlorophyll; Which peculiar to plants; What is formed with the carbon; What other bodies are constructed; Is chlorophyll found in animals; What is necessary for chlorophyll to be active; How do animal cells act; By this wear what is produced; What cells have synthetical action; What action have animal cells; Chlorophyll and the sun's rays has what effect on potential energy; Relation of light to animal life; Function anabolism; Katabolism; Difference in food of animal and vegetable; Composition; Movement; Digestive apparatus; From what does life start; What is the *blastoderm*; From what formed; How; It divides into how many layers; Name them; What does epiblast form; Mesoblast;

Hypoblast; In studying the functions of the human body, what is first necessary; What does *anatomy* mean; Histology; Comparative anatomy; Embryology; What enables us to know the composition of dead tissue; What is necessary for cells to live; In what way are the tissues supplied with food; What carries the blood; What forces the blood to the tissues; What is most essential to life; What provision is made to supply it; What change must solid food undergo; What has been provided; After food is digested what becomes of it; What vessels carry on absorption; What becomes of food that is not digested; How are effete material removed from blood; How many elementary tissues; Name them.

**EPITHELIUM.**—Of what are these tissues made; How are cells of the body named; Give different shaped cells; From situation; Contents; Function; Origin; Give first method of cell connection; Kind structure this intercellular structure; What does it contain; Function; What is *membrana propria*; Give second process of cell connection; Give derived tissue elements; From what is intercellular substance derived; What makes up a fibre; From where do the fibres in connective tissue come; Of what do blood vessels originally consist; Two ways of cell death; Give example of abrasion; Chemical transformation; Pigmentary degeneration; To what is epithelium applied; Where found; What do epithelium cells possess; What holds cells together when epithelia form tissue; What causes cells to change shape; Is epithelial tissue vascular; How nourished; Have they nerve supply; How is epithelial tissue classified; What do you mean by simple; Name the varieties; Transitional; Stratified; Where find squamous epithelium; Name of the pigment in retina; In what animal is it absent; What is meant by endothelium; How demonstrated; Action of silver; Shape of cells lining blood and lymph vessels; How make the nuclei prominent; Where find endothelium ciliated; Where find germinating variety;



Where are stomata in peritoneum found; What are they; What passes through them; Where find pseudo stomata; Peculiarity of cells near stomata; What form secreting agent in gland; Where find columnar variety; Of what does it consist; Peculiarity of size and shape; Intra-cellular network; Spongioplasm; Cause of striated basilar border; Cause of their change to goblet-cells; What forms mucus; Describe ciliated epithelium; Where found; In what animals are cilia largest; Number in one cell; Size; Describe cilia; Motion; Direction; What will stop it; Is it voluntary; How long continued after death; Cause of the motion; Name cell with single cilium; What mean by transitional epithelium; Kind find in upper layer; Where find transitional; What mean by stratified; Kind cells find superficial layer; Middle; Where find stratified; As cells come to surface change in shape; Describe prickle cells; What fills interstices; Describe cells of the deepest layer; Where find protective epithelium; Protective and moving; Secreting; Protective and secreting; Sensorial; Appendages formed by epithelium; Function of cilia.

**CONNECTIVE TISSUE.**—What form the skeleton of the various tissues; Function; If all other tissue was removed what would we have; What are the elements that make up connective tissue; How many kinds cells; Describe the fixed cells; Where best observed; Tendon corpuscles belong to what cells; Where find branched pigment cells; Where found in the frog; Where absorb light; Amoeboid resemble what corpuscles; Of what do they consist; Why called migratory; How distinguished from branched connective tissue cells; Where found; What mean by plasma cells; Where found; Two varieties of intercellular substance; Describe white fibres; How isolate the fibres; By prolonged boiling what is produced; Size yellow elastic fibre; How tell from white; What is produced by boiling; Name varieties connective tissue; Chief form; Where found; Appear-

ance when fresh; Why; Appearance under the microscope; Describe the cells; What separate the rows of cells; How demonstrate cell space; Why cells appear striped; Where find yellow elastic tissue; Describe fibres; Where find fine elastic fibres; Thick fibres; Elastic membrane with perforation; Homogenous membrane; Where find areolar tissue; Appearance to eye when stretched; Under the microscope; Action acetic acid; What contains the cells; How cells connected; Where find gelatinous tissue; Where best seen; Give structure; Where fibrillated; Other name adenoid tissue; Where found; Give structure; In what are the fibrils soluble; In the embryo what occupies the place of fibrous tissue; Origin; What form; In what imbedded; How are fibres developed; Forms what kind tissue; What do fusiform cells develop; What becomes of fusiform cells; Other theory of the development of fibrous tissue; Function of areolar and fibrous tissue; Function of elastic tissue; Where adipose tissue absent; In what tissue is adipose seated; Give structure of adipose tissue; Size of vesicles; How demonstrate the membrane and nucleus; What causes cells to appear black; How are cells held together; Of what is oily matter composed; From what is adipose tissue developed; Give the process; If the process is reversed what is produced; Describe blood vessels in adipose tissue; Nerves; Give functions of adipose tissue.

**CARTILAGE.**—Give structure of all kinds cartilage; To what is the apparent difference due; What mean by perichondrium; Where absent; Do nerves supply cartilage; Name three kinds cartilage; Where find hyaline; Give structure; Describe matrix of hyaline cartilage; Action of acids on it; Where find canals; In what cartilage are fibres developed in matrix; Describe cells in articular; How are bones first formed; What is the cartilage called; What does it resemble; Where find hyaline cartilage without matrix; What called; Kind tissue hyaline cartilage; How nourished;

When contain blood vessels; Where find yellow elastic cartilage; Give structure; Where find the cellular variety; Kind cartilage never ossifies; Where find white fibro-cartilage; Give structure; What is produced by boiling cartilage; Function of cartilage; Out of what is cartilage developed; From what is matrix cartilage derived.

**BONE.**—Of what is bone composed; What is the animal matter called; By boiling what is produced; How can the earthy matter be separated from animal in bone; If animal is burnt out, shape of bone; When is the animal most abundant; Earthy; To the eye how many parts is bone made up; Name them; Describe the make-up of articular end of long bone; Shaft; Why called medullary canal; Describe the make-up of flat bones; Irregular bones; Kinds of marrow; Where find red marrow; Give structure of red marrow; From what are the giant cells derived; Where find yellow marrow; Give structure; What corpuscles are produced by red marrow; What does periosteum mean; Function; In what other way is bone supplied with nutriment; What are lacunæ; Canaliculi; In what bones are these the only canals contained; Describe Haversian canals; Why so named; Average diameter; From where do the lacunæ and canaliculi receive their nutriment; How blood vessels enter the Haversian canal; Relation of the artery and vein; Which the larger; What occupy lacunæ; Of what is bone really made; To what do bone corpuscles correspond; Describe the general lamellæ of long bone; Haversian lamellæ; Interstitial lamellæ; Give the ultimate structure of lamellæ; Give perforating fibres of Sharpey; Origin; Name bones ossified in membrane or fibrous tissue; Hyaline cartilage; What does membrane first form; Divides into what layers; Describe the external layer; Describe the internal layer; Which part of periosteum is concerned in formation of bone; Describe the osteo-genetic fibres; What is osteogen; Where are the lime salts deposited;



How are the osteoblasts arranged; What do they form; What find in center; What becomes of the deeper layer of periosteum not converted into bone; What surrounds cartilage; How many layers; What find in deeper; Outer layer; Difference between foetal perichondrium and periosteum; Name chief intermediate stages between hyaline cartilage and adult bone; What becomes of the material which forms cartilage; How do blood vessels grow in cartilage; Where begin; What is found in cartilage containing no blood vessels; What do these channels contain; What is next deposited; Give substitution of embryonic spongy bone for cartilage; Periosteal bone for the primary embryonic spongy bone; What bounds medullary cavity; How enlarged; How is compact bone formed; Why think bone grows interstitially; Does process of ossification differ; From what is all true bony tissue formed; Where are the lime salts first deposited; What becomes of this calcified cartilage; What precedes the formation of real bone; Give difference between calcification and ossification; What are centers of ossification; Long bones have how many; Where found; How do bones increase in length; Part of bone that grows; Proof; If intermediate cartilage is removed how is growth affected; How is increase in thickness of shaft brought about; Where place metal plate to become covered with bone; What other tissues may become ossified; Function of bones; What often saves them from fracture.

**TEETH.**—How many sets of teeth have man; Names; How many milk teeth; How many incisors; Canine; Molars; Number of permanent teeth in each jaw; Name permanent teeth; To what are the bicuspid in adult successors in the child; In what do the temporary incisors and canine differ from permanent; First milk tooth; Time; Second; Time; When canine appear; Deciduous molar; First permanent tooth; Time; When incisors appear; Bicuspid; Canine; Second molar; Third molar; Other name; Variation of

cutting teeth in children; What incisors make appearance first; What disease would retard eruption of teeth; How do milk teeth usually come; Time milk teeth should be in use; Where do permanent teeth appear; Relation of the wisdom tooth to civilization; Relation of upper to lower teeth; Cause of their overlapping; Function of incisors; Canine; Reason for no two teeth opposing each other; If a tooth is lost, what becomes of the opponent; What is the crown of a tooth; Neck; Root; What find in center of tooth; Shape; What surrounds it; Give the anatomy of the pulp cavity; What is membrana eboris; Where blood vessels enter tooth; In what way are nerves connected with dental tubes; Do lymphatics exist in the pulp; What covers part of dentine above gum; Beneath the gum; What is Nasmyth's membrane; Difference in composition of dentine and bone; Into what can the animal matter be converted; Of what is the earthy matter chiefly made up; With what do dental tubules communicate internally; Externally; In what do these tubes lie; How give off branches; Average diameter of tubes; What do they contain; What are their prolongation from the pulp; What mean by granular layer of dentine; How characterized; Hardest part of tooth; Chemical composition; Amount animal matter; Give structure of enamel; Where find lacunæ; Other name; Part of tooth is true bone; With what do lacunæ sometimes communicate; How does cement differ from ordinary bone; First step in the development of teeth; What does this form; Next step; Third step; What is the dental papilla; What forms dental sac; What forms partition between teeth; Give composition of the papilla; What forms dentine; Tooth pulp: Give method of formation of dentine from odontoblasts; What shape does papilla take; Relation of dentine to papilla; Where vessels and nerve enter; What determines the number of roots; When are roots formed; How many layers has enamel cap; Name of internal; Middle; External; What forms

enamel; Where does calcification first take place; Function middle cells; What become of external; What forms cement; What forms dental periosteum; What causes tooth to cut through gum; How are permanent teeth produced; Name; When do temporary teeth begin to develop; Permanent.

**MUSCULAR TISSUE.**—Kinds muscular tissue; What mean by striated; Non-striated; Where is unstriated found; Where find it in skin; Cause cutis anserina; Give structure of unstriated; Appearance, if broken; Describe sheath surrounding fibre; What mean by endomysium; Perimysium; Where find striated muscles; How divided; What mean by skeletal muscle; Epimysium; Where are the blood-vessels and nerves; Direction of each fasciculus; Does it extend the whole length of the muscle; What is the sarcolemma; Describe it; Length of muscular fibre; Color; How marked; Appearance of striated muscular fiber under the microscope; Explain Dobie's line; Henson's disc; What mean by sarcostyles; Sarcous elements of Bowman; Cohnheim's fields; Sarco-plasm; Where find muscle corpuscles; Describe a muscle casket; Where find muscle rods; Why do these rods separate during muscular contraction; Give the reticulum theory; Give Rollett's view; Give Schafer's view; appearance under polarized light; What does anisotropous mean; Isotropous; Describe muscular fibers of heart; Other places find branching fibres; Kinds skeletal muscular fibre; In which longitudinal striæ most marked; Describe blood supply in voluntary muscles; Do vessels penetrate sarcolemma; What nerves supply striated muscles; Unstriated; How nerves terminate in unstriated muscles; Name of the plexus; How made; How intermediary plexus formed; Describe distribution of the fibrils; How nerves end striped muscles; With what is sheath of nerve continuous; From what are cells of unstriated fibre derived; How is striped fibres formed; How do muscles grow; Describe the fibre in pregnant uterus; Change they undergo in involution.

**NERVE FIBRE.**—Name kinds nerve fibres; Name parts of a medullated fibre; When can they be demonstrated; When appear homogeneous; Color axis cylinder becomes; Substance of Schwann—Sheath; Other name; Describe it; Where find nerve corpuscles; Describe white substance of Schwann; Describe the small rods; Of what is the axis cylinder composed; Is it always present; Why think it is essential part of a fibre; Function of the other parts; What are the nodes of Ranvier; Where does sheath come in contact with axis cylinder; What mean by internode; What unites the internodes; Action of nitrate silver on it; Where find largest nerve fibre; Smallest; Where find non-medullated nerves; Size; Color; Part absent; Where are the fibres always non-medullated; What is meant by perineurium; Epineurium; Endoneurium; Describe the course of fibre from its origin; How nerve fibre anastomose; When do fibres divide; Where do nerves form plexuses; Object; How do medullary nerves terminate; Other name for nerve cells; Where found; Describe the structure of nerve cell; Where find single cells; What mean by unipolar; Bipolar; Multipolar; Give structure of the poles; Give distribution of poles; When continuous with nerve, what is it called; What encloses ganglion cells; Where are nerve fibres and cells continous; Where find Pacinian corpuscles; Other name; Give structure; Describe the termination of the nerve in the corpuscle; Where find corpuscles of Herbst; Describe them; Where find end bulbs; Size; Shape; Structure; How nerve fibre terminate; Where find tactile corpuscles; Shape; Size; Give structure; In what papillæ are they found; Describe the termination of the nerve; Name of the learned touch; Where find corpuscles of Grandy; Give structure; How nerves terminate; Other termination of sensory nerve; Where in plexuses.

**CHEMICAL COMPOSITION OF THE BODY.**—How many elements combine to form the

chemical basis of the body; Name elements that contribute the largest share; Oxygen and carbon make up what per cent. of the whole; Name most abundant of the metallic elements; In what form are the elements found in the body; Name elements found free; Where find each; To what is organic applied; State cause of the instability of nitrogenous compounds; Give classification of substances found in body; Where find nitrogenous organic bodies; Composition: Name the chief of the nitrogenous; Where found; Do we know the composition; Can they be formed in laboratory; What does proteid mean; Give properties; Give the reactions; Give the other tests; On what basis are proteids divided; Give properties of native albumins; Derived albumins; Globulins; Proteoses; Peptones; Fibrin; Coagulated proteids; Lardacein; Three varieties native albumin; Where find egg albumin; Give properties; Where find serum albumin; Properties; Varieties derived albumin; How acid albumin made; Properties; How alkali albumin obtained; Properties; Difference between acid and alkali albumin; What is caseinogen; How obtained; Properties; Properties of globulins; What is crystallin; How differ from other globulins; What is rugosin; How obtained; Properties; Where find paraglobulin; Properties; How obtain fibrinogen; Properties; How obtain vitellin; Properties; What is globin; What are proteoses; Peptones; How fibrin obtained; Coagulated proteids; Lardacein; How obtain gelatin; Properties; Give the reactions; What is mucin; How obtained; What is elastin; Properties; What is chondrin; Properties; How obtain keratin; Nuclein; Properties; To what class do oils and fats belong; Composition; Properties; What are carbohydrates; Name the amyloses; Sacharoses; Glucoses; Most important one; Where found; Give properties of starch; Tests; What will convert it into grape sugar; What is glycogen; Properties; What is dextrin; Properties; Where find cane sugar; Properties;



What is lactose; Properties; What is maltose; Properties; Where find glucose; What is it; Properties; What is dextrose; Properties; Levulose; Properties; Galactose; Properties; Inosite; Properties; Name fatty acids found in body; Aromatic series; What is phenol; Origin of the inorganic principles; Which are decomposed; Which are formed in organism; Name the gaseous matters found in body; Which are found especially in intestines; Where find carbonic acid; How excreted; Most abundant of the proximate principles; Where find it; Amount in blood; How know when need water; Is it essential; How long live without it; Function of water; Amount water introduced; Produced in body; How; Condition favoring it; Per cent. eliminated by alimentary canal; Lungs; Skin; Kidneys; Where find sodium and potassium chlorides; Which most abundant; Where chloride potassium most abundant; Are the chlorides essential; Where find fluoride calcium; Where find phosphates; Which are found in teeth and bone; Condition of bones in early life; Old age; Cause; Deficiency of phosphate lime causes what trouble; Why called rickets; How remove earthy salts from bone; Cause alkalinity of blood; Where find calcium carbonate; Only salt found in crystalline form; Where find sulphates; Silicon; Iron; Name other inorganic principles occasionally found in body.

**BLOOD.**—Function of blood in a general way; Color arterial blood; Venous; How many parts make up blood; Name; What is plasma; Other name for the protoplasm; To what is color due; Why is blood opaque; Action of chloroform on blood; Specific gravity of blood; How estimate it; Reaction of blood; Taste; Temperature; Where warmest; Coolest; Odor of blood; How developed; Amount of blood; How determined; Time day it is greatest; What would diminish the amount of blood; If blood is drawn and allowed to stand, change it undergoes; Name; Time of coagulation; Why not escape if vessel is inverted;

Name of solid mass; Change in clot if watched for a few minutes; Time serum begins to exude; Complete; Cause of blood clotting; Why water separate from clot: Of what is solid part composed; On what does color of clot depend; Color if coagulate rapidly; Color on top if coagulate slowly; What is *crusta phlogistica*; Shape of upper surface of clot; How prove that clotting of blood is due to formation of fibrin; From what is fibrin derived; What is stroma fibrin; Normally, from what is fibrin derived; What is plasma; How obtained; What causes the viscosity that precedes coagulation; How prevent blood from coagulating; What is plasmin; How obtained from plasma; How differ from fibrin; What is composition of plasmin; How obtain fibrinogen from it; Paraglobulin; From what does the ferment come; Proof; The presence of what salts are necessary for coagulation; Other changes besides solidification when blood clots; Why think fibrin ferment a globulin; Name the conditions that will hasten the coagulation of blood; Name those retarding it; Why does blood not coagulate in living vessels.

**BLOOD CORPUSCLES.**—How many kinds corpuscles; Red corpuscles form what per cent. of the mass of the blood; Proportion of white to red; Shape red corpuscle; Size; Color; Structure; Describe stroma; Is corpuscle solid; Where is coloring matter; Where corpuscle hardest; Have red corpuscles nuclei; Why appear dark; Specific gravity; What mammals corpuscles differ in shape; Are all red corpuscles same size and shape; What are microcytes; What are blood plates; How form masses; What mean by *rouleaux*; Cause; Action of pressure on red corpuscle; Action of water; Saline solution; Acetic acid; Alkalies; Chloroform; Tannin; Magenta; Boric acid; Ammonia; Carbonic acid; Oxygen; Heat; Electricity; Other names for white corpuscle; Shape; Why granules more marked in some than others; What always exists in corpuscle; Size corpuscle; Proportion to red;

On what does the variation depend; How influenced by eating; Period of life found in greatest quantity; Least; Name two chief varieties of white corpuscle; Origin of the small; Describe the third variety; Name movement of white corpuscle; Movement greatest in which corpuscle; Explain division of corpuscles; Action of reagents; What is phagocytosis; How are corpuscles counted; Number per cubic millimetre; What is plasma; How obtained; What does it contain; How differ from serum; How freed from white corpuscles; Amount of water in plasma; Fibrin; Other proteids; Fat; Inorganic salts; Name salts; Which most abundant; Amount; What is serum; Give characters; Specific gravity; Proportion of clot serum; How obtain serum from blood corpuscles; Amount water in serum; Name proteids; Amount; On what does amount of water in serum depend; Chief proteids in serum; What is serine; What will cause it to coagulate; How differ from egg albumin; What will cause it to precipitate; Action after being dried; What will precipitate serum albumin from serum; How obtain serum globulin from serum; Heat necessary to coagulate it; Why more in serum than plasma; Describe the fats of serum; Where find grape sugar; Name the extractives; What is the yellow pigment; Amount water in red corpuscles; Solids; Most important solid; Amount; Name the other proteids; Fatty matters; Name the inorganic salts; Salt most abundant; What does white corpuscle contain; Give structure of the stroma; Of what do the proteids consist; Chief salts of the corpuscle; Give properties of fibrin; Per cent. in blood; Action of gastric juice on it; Explain its action with hy-dric peroxide.

**GASES OF THE BLOOD.**—Name gases of the blood; Amount; Difference in amount of oxygen in arterial and venous blood; Carbonic acid; Nitrogen; In both kinds blood most oxygen or carbonic acid; How extract gases from blood; Condition of oxygen in blood; Explain condition of equal tensions;

Does oxygen of blood obey this law; With what is oxygen of blood combined; Amount hæmoglobin in corpuscle; How obtained; Most interesting properties of hæmoglobin; Name animals it crystallizes most readily; Effect of light; Hæmoglobin that crystallizes with difficulty; In what are the crystals soluble; Explain the appearance of oxyhæmoglobin with spectroscope; Action with mercurial air pump; When does venous blood fail to show the oxyhæmoglobin band; Action of carbonic oxide on hæmoglobin; Amount carbonic oxide taken up; Will oxygen displace it; Why is breathing carbonic oxide so dangerous; Action of nitric oxide; Nitrous oxide; Sulphuretted hydrogen; What is methæmoglobin; How produced; How estimate amount of hæmoglobin; Where find hæmoglobin; In what unstriped muscle is it found; What is hæmatin; Hæmochromogen; Hæmatoporphyrin; Give action of acid solution with hæmatin; Alkaline solution; What is hæmatoidin; Hæmin; Condition carbonic acid is found in blood; Amount in plasma; What does combined form; In what condition is the nitrogen in the blood; Amount of water in blood; Corpuscles; Proteids: Fibrin; Fatty matter; Salts; Gases and extractive; Variation of blood as regards sex; Pregnancy; Age; Temperament; Diet; Effect of bleeding; Why cause thirst; Variations in different parts of the body; Arterial and venous; Peculiarity of blood in portal vein; Gastric vein; Splenic vein; Hepatic vein; What mean by *area vasculosa*; Where first corpuscles developed; Describe the development of first corpuscles; From what do cells come; Describe the development of vessels; Size corpuscles at first; Describe corpuscle; They have what movement; How multiply; What organs first produce them; How do these multiply; When disappear in the blood; Origin of mature colored corpuscles; Explain intracellular; Where red destroyed; Origin white corpuscles; How increase; Function of blood.

**HEART.**—Cause of blood circulating; How many circuits; What mean by circuit; Describe the lesser; Other names: Describe the greater; Other names; Describe portal circulation; Renal; Where find heart; In what mediastinum; What does mediastinum mean; How many: In which is heart; What surrounds heart; What does pericardium mean; What is pericarditis; What is dropsy of heart; Kind membrane is pericardium; Which fibrous; Serous; Shape pericardium; Direction apex; Base; To what is base attached; Apex: What mean by parietal layer of pericardium; Visceral: Name of the fluid; Function; Relation of heart to sternum; Give anatomy of heart; Capacity of ventricles during life; Auricles after death; Why called ventricles; Auricles; Length of heart; Width; Thickness; Average weight in adult; Change in old age; What is the structure of heart; What forms boundary of auriculo-ventricular opening; What find at origin of arteries; Do fibres of auricles and ventricles communicate; Describe muscular fibres of heart; What does endocardium mean; Kind tissue; What is inflammation of it called; What valves in right auricle; Do they assist adult circulation; Part of heart find valves that assist circulation; What valves in right ventricle; Left; Name of the valves guarding right auriculo-ventricular opening; What does tricuspid mean; Name of each; Which largest; Why; Right attached to what border; Shape of each cusp; To what is base attached; What is attached to ventricular surface and borders; Function of chordæ tendinæ; To what are they attached; What does columnæ carneæ mean; Varieties; Describe muscoli papillares; Where find mitral valves; Other name; Why; How differ from tricuspid; Where find semilunar valves; Which perfect; Why; To what is convex margin attached; What is corpus arantii; Where find sinuses Valsalva; Function; Give structure of valves; Movements of heart; Why rise up; Go forward; From left to right; What mean by systole; Diastole;



Why begin at auricles in studying the circulation; Through what vessels does blood get into right auricle; While auricles are filling condition of the auriculo-ventricular opening; Describe the contraction of auricle; When does contraction begin; Last part to contract; What resists regurgitation of blood into the veins; To what point does the regurgitation extend; What completes the dilatation of ventricles; Describe ventricular contraction; After contraction in what cavities does blood remain; Which ventricle shortens during contraction; Change left undergoes; Effect of systole on length of heart; Function of auriculo-ventricular valves; What brings them in place; When closed; Open; Effect of systole of the breadth of the base; Function of this diminution; Why muscular fibres of heart run in different directions; What helps to expand ventricles; Explain safety valve action; What opens semilunar valves; Closes them; Explain the cords of the valves; Where absent; Part of second each heart beat occupies; Time of auricular systole; Diastole; Ventricular systole; Diastole; Rapid action is at the expense of which; Cause of blood going from right auricle to ventricle; Function of auriculo-ventricular valves; When closed; Opened; When closed what is blood doing; What valves are open; Function semi-lunar valves; When closed; Open; When semi-lunar valves closed what is heart doing; Open; State appreciable phenomena of heart; Cause; Studying rhythm of heart, where begin; Why; Rhythm of sounds, where begin; Why; Name sounds; Why call long one first sound; Which sound simple; Cause second sound; How prove; Elements that make first sound; Cause booming element; Prolonged; Valvular; How make first like second sound; Give causes first sound; Where heard loudest; Why; Condition heart; Course blood when hear first sound; What keeps blood from going back in auricles; Valves which side heart may be diseased; Abnormal sounds caused by disease of mitral valves are heard where;

When; Condition of ventricles just before hear first sound; Blood flowing from auricles into what; Does blood usually cause sound in passing to ventricles; Why not; What would obstruct flow blood from auricle to ventricle; If valves are tied and can't open would blood passing through cause sound; Why; Where hear this sound; When; What is heart doing; Cause of this sound; What is it called; Why; Condition of valves is called what; Why; Condition of heart during first sound; Course of blood; If mitral valves do not close auriculo-ventriculo-opening, direction of the blood; Effect of this backward flow of blood on first sound; This condition of the valves is called what; Sound; Where heard; When; Direction of blood when hear it; If heart is beating rapidly, how tell first from second sound; If hear abnormal sound just before feel pulse, what is it called; Cause; When you feel pulse; Name; Cause; Where hear second sound loudest; Why; Cause second sound; What valves are closed when hear it; Open; Does blood cause sound normally while passing from ventricle to aorta; When would it; Why; Where hear it; When; What is it called; Condition heart when you hear it; Function of semi-lunar valves; If don't close opening where will blood go; Effect of this backward flow on second sound; Instead of second what would have; Cause this abnormal sound; Where hear it; When; What is it called; Why; Condition heart when hear it; What mean by impulse; Greatest in what people; Felt most what act of respiration; Cause of impulse; How registered; How often does heart contract in healthy adult man; Woman; Pulsation before birth; At birth; First year; Second; Third; Seventh; Fourteenth; Adult; Old age; How influenced by temperament and sex; Food and exercise; Diurnal variations; Posture; Atmospheric pressure; Temperature; Relation of pulsation to respiration; The force of which ventricle is greatest; Why; How does left ventricle assist right;

How estimate work done by left ventricle; Right; What property does the heart muscle possess which is found in no other muscle; How is this property shown; Kind of action is this rhythmical contraction; Name ganglia in heart with location; Kind cells make up these ganglia; Action of frog's heart when removed from body; If heart is cut to pieces; Parts where movement is greatest; How prove heart can contract without influence of ganglia; Cause of the rhythmical contraction; Give difference of action in heart and ordinary muscle when subjected to stimulus; If stimuli are repeated rapidly, which will become tetanic; To increase contraction in frog's heart, when must the stimulus be applied; How make skeletal muscles tetanic; Give Stannius' experiment; Explain blocking; Part of heart most irritable to stimuli; Usual direction of wave of contraction; Can it be reversed; How is wave of contraction affected by partial division of muscle; Velocity of wave of contraction in frog's heart; Give similarities of contraction in skeletal and heart muscle; Cause of the automatic rhythmic movement; What will influence it; Name the inhibitory nerve of heart; Accelerating; How is heart influenced by cutting vagi; Stimulating; Stimulating distal extremity; Action of digitalis on heart; Why; How heart influenced by cutting sympathetic; Stimulating it; How action of sympathetic differ from vagi; Give origin of cardiac nerve fibres in a frog; In the dog; Where would stimulation of vagus not be inhibitory; Where is the cardio inhibitory center; How could the restraining influence of this center be reflexly increased; Give an example; Explain how heart is stopped; Could inhibitory be reflexly lessened; In man, inhibitory action of pneumogastric comes from what; Give distribution of vagus in heart; Course of augmentor fibres in cord; Action of venous blood on inhibitory centre; Oxygenated on augmentor centre; Action of cold on heart; Heat; Atropin; Muscarin; Digitalin; Verat-

rin; Aconitin; Nicotine; Give electrical phenomena of the heart beat; What is necessary for a continuance of the rhythmic contraction of heart; What fluid will cause it to beat for awhile; When does anabolism take place in the heart; Catabolism; What is increased by stimulating pneumogastric; Sympathetic; Relation amount of blood to contraction; Resistance would have what action; What mean by asystolism; Influence by pressure on heart.

**FÆTAL CIRCULATION.**—Tracing foetal circulation where begin; Blood goes from placenta to child through what vessel; Kind blood; Where does vein enter abdomen; Goes to what organ; Meets what vein; Greater part of blood distributed to what organ; Does all of it pass through liver; Gets into what large vein; How; Where does inferior vena cava empty; Part of right auricle; Current is directed to what opening; What prevents this blood from going into right ventricle; Give attachment of eustachian valve; When largest; How does blood get from right to left auricle; Where does it go from left auricle; Left ventricle; From aorta; Does it all pass to upper extremities; How returned from upper extremities; How empty in right auricle; Direction of current; Where does it go from right auricle; Right ventricle; From pulmonary artery; How much passes through lungs; Where find ductus arteriosus; How does blood get back to placenta; Peculiarity of internal iliac arteries in foetus; How many cavities in foetal heart; How auricles connected; Ventricles; Peculiarities of foetal heart; Arteries; Veins; Changes that take place in each after-birth; Why liver so large at birth; Head; Lower extremities so small; From which side does membrane grow that closes foramen ovale; When closed.

**ARTERIES.**—How many; Name them; What does aorta mean; Pulmonary; Why called arteries; Why thought to contain air; Why open; Course of arteries; Why; How protected; Where inosculate

freely; Why; What arteries diminish in size; Branches given off what angle; Where subject to pressure; Name coats of arteries; Give anatomy of external coat; What forms middle coat of large arteries; Small arteries; Change in middle coat as you go from heart; Give anatomy of internal coat; Name parts of internal coat; What does vasa vasorum mean; What supply; Origin; Nerves supply what part of artery; Name of the nerves; What does it mean; Where is the vaso-motor center; From the centre where do the fibres go; Where do secondary centres exist; What may alter or modify chief centre; How do stimuli act; The afferent influence is brought about by what nerve; Where arise; Where does it go; If the nerve is cut and stimulus is applied to central extremity, how is arterial pressure influenced; Through what nerve does it act; What does splanchnic mean; Function of the depressor nerve; Effect of stimulating an afferent nerve; Give an example of vaso-motor centre affected by cerebrum; Symptom if sympathetic in the neck is cut; How long remain dilated; Cause constriction; Give first division of vaso-motor nerves; Second; Third; Fourth; Give example of fourth class; What mean by vaso-motor dilator; Vaso-motor constrictor; Name the anabolic nerve to the artery; Catabolic; How produce an increase in blood pressure through the nervous system; A decrease of the blood pressure; How blood pressure influenced by loss of blood; Influence of injection of blood; How influenced by quality of blood; What mean by arterioles; Cause of peripheral resistance; Where friction greatest; What is arterial pressure; How would you note arterial pressure; Where greatest; What does the pulse represent; Blood pressure in aorta is equal to how many pounds; Pulmonary artery; Where is it greatest; How is its veins; Give causes of variation of pressure; During systole what protects the arteries from suddenly exerted pressure; After systole what do arteries do; If arte-



ries were rigid tubes, how would blood flow into capillaries; How would heart have to pulsate during functional activity of glands; What arteries are most elastic; Least; Function of elasticity; How does blood flow from heart; In large arteries; Small; Capillaries; Cause; What arteries are most contractile; Least; Function of contractility; What mean by tone; Cause of arterial circulation; Conditions for elasticity to assist circulation; What is the pulse; Cause; Distention causes what change in artery; By finger can we tell dilatation from elongation; Is pulse perceptible at the same moment in all arteries; Difference in time of any two arteries; Difference in the rapidity of wave and current; Briefly describe sphygmograph; Is the tracing the same in all arteries; What does up stroke represent; Decline is usually marked by what; What mean by dicrotic wave; Pre-dicrotic wave; Post dicrotic; Where is the wave of blood greatest in arteries; Least; Explain tidal wave; Percussion wave; What is catacrotic wave; Anacrotic; What is dicrotic pulse; Cause; What is hyperdicrotic; What mean by waves of oscillation; Cause of anacrotic notch; What does dicrotic notch indicate; Cause of percussion wave; What will increase it; Tidal wave; Dicrotic wave; Relation of the capacity of the arteries to that of the capillaries; Rapidity of flow of blood in large arteries during systole; Diastole.

**CAPILLARIES.** Give anatomical definition of capillaries; Physiological; How many kinds capillaries; What mean by pulmonary; Systemic; Where find them; Absent; Name characters of capillaries; Give the structure; Relation of nerves to capillaries; Common size; Where find smallest; Largest; Upon what does size of capillary depend; Two chief kinds of mesh; Which most common; Where found; Where observe the elongated; What determines the vascularity of a part; Where is it closest; Where are the interspaces smaller than the vessels; Peculiarity of

these in kidney; Brain; Mucous membrane; Where the meshes largest; Relation of activity to vascularity; How tell inactive tissue; Name some; Length of capillary; Rapidity of circulation; Time blood is going through capillaries; Where is the chief resistance to the circulation; Describe circulation of red corpuscles in capillaries; Occupy what part of stream; What mean by still layer; Cause; Part of stream find white corpuscles; Why adhere; Phenomena of white when motion of blood is weak; Why is flow of blood continuous; When will capillaries pulsate; Color of blood in veins when capillaries pulsate; Cause of capillary circulation; Capacity of capillaries compared with arteries; When will red corpuscles pass through the walls of the vessels; White; Cause; Name; What are stomata; Relation of capillary circulation to respiration; Cold; Heat; Irritant; Cause capillary dilatation; Are they contractile.

**VEINS.** Why called veins; Where begin; End; Only function; What are superficial veins; Deep; What artery has no vein; Why do veins anastomose; Capacity of veins compared with arteries; What artery larger than the vein; Why veins collapse when cut; What vein will not; Why not; Reason for hepatic vein remaining open; Which stronger, artery or vein; Why should veins be strongest; Strongest which extremity; Name coats of veins; Give structure of external coat; Middle coat; Where contain striped muscular fibres; Give structure of internal coat; Describe lymphatics of arteries and veins; Where are valves found in veins; Absent; Describe the structure of the valve; How many valves; Where are they placed in a vein; Valves most numerous which extremity; Why; Where is a vein strongest; Weakest; Any valve in spermatic vein; Into what vein does left spermatic empty; Left renal; Argle; What is varicocele; On which side does it occur; Why; What are piles; Causes that predispose to them; What other outlet have hemorrhoidal veins

beside liver; Are the valves in external jugular perfect; What does pulsation in it indicate; Internal jugular unites with what vein; What do they form; Why should there be a perfect valve in the internal; Why not in the external; Internal returns blood from what kind of tissue; External; How is flow of blood in arteries; Capillaries; Veins; Course of blood in veins; How are they arranged so the onward course should not be impeded; Under what circumstance would the blood be intermittent in veins; Venous pressure compared to arterial; Rapidity; Main cause venous circulation; Causes that assist; When will muscular contraction; Act of respiration; How; Distance this force extends; Why extend below to liver; What will vein do if suction-force is applied to it outside of body; Why not the same way in body; Give illustration of gravity assisting venous circulation; Which coat is contractile; Function of valves; Conditions that impede venous circulation; Act of expiration is thoracic cavity smallest; Kind muscular contraction; When is blood not flowing into heart; Course of blood during systole; Rapidity of flow of blood in veins; Time blood makes both circuits; On what is the experiment based; Another mode of estimating.

**LOCAL PECULIARITIES OF THE CIRCULATION.**—Name arteries that supply brain; Why anastomose so freely; In what way are the small arteries protected; Give peculiarity of veins in brain; Kind box is cranial cavity; Subject to atmospheric pressure; Does quantity fluid in cranial cavity vary; Blood; Fluid that equalizes pressure; Where find it; Does central canal communicate with brain; Where; When does this fluid rise up in brain; Recede; Act of respiration fontanelles bulge; Why; Recede; Why; Peculiarity of the vessels of the brain; Give chemical composition of cerebro-spinal fluid; Name some erectile tissue; Give anatomy of corpora cavernosa; Describe the veins; What limits the distension; De-

scribe the fibrous tissue in corpus spongiosum; What returns the venous blood; What muscles interfere with the return circulation; What causes the erection; Exciting cause; Origin; Through what nerve is this influence carried; What does pudic mean; Part muscles play in erection.

**RESPIRATION.** What is respiration; What organs bring blood and air in close proximity; Name the lungs of the fish; In what animals is the skin important as an organ of respiration; Does skin play an important part in man; If respiration is disturbed where referred; Where take place; Part lungs play; Conditions in lungs necessary for respiration; Where lungs situated; How communicate with the outside; Name the respiratory passages; What does larynx mean; Where located; Shape; Name cartilages forming it; What does it contain; What are the vocal cords; Which are true; What is space between them called; Shape epiglottis; Where situated; What lines larynx; Where thin; Kind cartilage in larynx; Epiglottis; What surrounds it; What are the surfaces of the epiglottis; Describe the anterior; Posterior; Kind fibrous tissue in epiglottis; Peculiarity of the glands; Where find taste goblets; What does trachea mean; Where begin; End; Into what does it divide; Length; Diameter; Number of rings; Rings occupy what part of the circumference; What fills up space not occupied by rings; Rings belong to what variety of cartilage; Where find unstriped muscular fibres; Direction; Function; Where find longitudinal fibres; Function; Kind tissue is mucous membrane; Where find basement membrane; What does it contain; Describe the epithelium; Where are the glands; Number bronchi; Which largest; Longest; What do bronchi resemble; How differ; Where cartilage surround tube; Where bronchi end; Give structure of bronchi; Kind epithelium covers mucous membrane; Where do the rings stop; What connect bronchi with air cells; Describe epithelium in small tubes;

Muscular fibres; Part of thorax occupied by lungs; Briefly describe their make-up; What surrounds lung; Kind membrane; Name; Why; Name the layers; Kind sac; Name of the space; Name layer that covers lung; Inner surface of chest; What does parietal mean; Position of layers in health; Name of fluid in cavity; Function; Why is there no space in normal condition; Why don't lungs collapse; Why collapse when hole is made in chest wall; What is pleuritis; Hydrothorax; Pneumothorax; Empyema; Number layers of pulmonary pleura; Give structure of outer; Inner layer; Describe the lymphatics; Where muscular fibres; Function; Number of lobes in right lung; Left; Into what do these lobes divide; Give the make-up of each pulmonary lobule; Describe the termination of the bronchi; What mean by infundibulum; Inter-cellular passage; Size air cell; Kind wall; What lines air cells; Where find elastic fibres; Describe the capillaries; Where are air cells smallest; Why; From what sources do lungs receive blood; Why is venous blood sent to lungs; What blood furnishes nutrition to the lungs; Describe arrangement of lymphatics; Give nerve supply; Name the acts of respiration; Which active; Passive; How is inspiration brought about; Expiration; Chest enlarges in what direction in inspiration; Muscles engaged in ordinary inspiration; What enlarges chest in vertical diameter; What does diaphragm mean; Part that is muscular; Tendinous; Part that goes down; What prevents it from pulling in sides of chest; Cause of the increase in the lateral and antero-posterior diameter; Where does elevation of ribs take place; What ribs move most in front; Why; Give axes of rotation; Name muscles that raise ribs in ordinary inspiration; Expansive movements in tranquil breathing is greatest in what part of chest; Forced inspiration; Name extraordinary inspiratory muscles; Name types of respiration; What is the abdominal; When seen; What is inferior costal type;



By whom used: Type used by women; Why; What is expiration: Kind act: Two forces that produce it: What constitutes the elasticity of lungs; How prove lungs are elastic; Why do lungs go down in inspiration; Why is it that lungs do not fully collapse after death; When are walls of thorax most elastic; Why; Reason for fractures being so frequent in old age; Kind of fractures in young people; Why; Give muscles of ordinary expiration; Describe them; Why can't lungs contract to their utmost; Which longest expansion or contraction of chest; In whom is inspiring shorter than expiring; What would represent inspiration; Expiration; Describe respiratory murmur; Cause; Period of life heard loudest; Name; What does puerile mean; Where heard in adult male; Why; Female; Why; Describe bronchial breathing; Relation of respiration to heart's action; Does this hold good in disease; Exception; Which act of respiration longest; Sound; Peculiarity of every fourth respiration; What opens rima glottidis; What is tidal air; Amount; What is complemental air; Amount; Reserve air; Amount; Residual air; Amount; What mean by vital capacity; Includes what air; Amount air changed in twenty-four hours; How determine respiratory capacity; To what are variations due; Average vital capacity of an ordinary man; Standard height; For every inch above the standard how much is the capacity increased; Diminish for every inch below; Under what weight is the capacity not affected; If above this point how does it diminish; Capacity is increased between what ages, what rate; Diminishes what rate between thirty-five and sixty; Difference in capacity of men forty and sixty years old, same height and weight; Number respirations in adult; When greatest; Relation to heart's action; Diseases respiratory acts increase in quicker proportions; Inspiratory muscles act greatest in individuals of what height; Changes above this height; Which force strongest, inspiratory or expiratory; Cause;

What is force of inspiration employed to overcome: Function of muscular fibres of bronchial tubes: Composition of air: Amount carbonic acid in air: Watery vapor: Changes in air after respiration: Source of heat in expired air: Blood warmest which side heart: Why: Amount carbonic acid in inspired air: Expired: Oxygen in expired air: Amount carbon expired in a day: Carbonic acid: Name conditions that would increase it: How influenced by age: Sex: Respiratory movements: Season: Air: State of air: Period of day: Food and drink: Exercise: In what does air lose in passing through lungs: Amount of oxygen is not accounted for in the carbonic acid: What becomes of it: Would increase of oxygen in air increase the consumption: Changes of nitrogen by respiration: Amount water exhaled in a day: What would increase it: How prove: Ammonia in expired air: Organic matter: Amount tidal air: Relation of this amount to the capacity of bronchial tubes: What causes it to come in contact with air cells: Law of diffusibility of gases: Explain why the oxygen of the air is taken up by blood: Carbonic acid of blood goes to the air: Describe the circulation of blood in lungs: Give the changes the blood undergoes in passing through lungs: Give respiratory changes in the tissues: What mean by a sphincter: Give mechanism of sighing: Hiccough: Coughing: Sneezing: Speaking: Singing: Sniffing: Sobbing: Laughing: Yawning: Sucking: Is respiration voluntary: Can we influence it: Give location of respiratory center: Action of medullary center during inspiration: Result if one of these sets of nerves be divided: What kind of a center is the respiratory: How is respiration affected if divide both vagi: One: If stimulate central end: To what are afferent impulses due: Give the action of the superior laryngeal nerves: Glosso-pharyngeal nerves: Other sensory nerves: Action of afferent stimuli on respiratory center: Can the centers send out efferent impulses without them: Effect of removing brain above

the bulb: Cut cord below bulb: Why think respiratory centers automatic: In what does automatic action of the centers consist: Difference between vagi and cerebral tracts: Cause of periodic respiration: What is dyspnoea: What will stimulate respiratory center: Action of metabolism of center on respiration: Muscular metabolism: Deficiency of oxygen in blood: Why think inspiratory and expiratory centers bilateral: What is apnoea: Old idea of the cause: Give present idea: Can apnoea be produced if vagi are cut: Sensation experienced on entering closed room filled with people: Cause: Change after remaining in room: Why: To the expense of what is the adaptation: How did Bernard illustrate it: Conditions that resist vitiated air longest: Amount cubic space per head for each person: Why is the atmospheric pressure inside the thorax during inspiration not as great as that on outside: When is the pressure least on heart and lungs: Why thoracic arteries and veins dilate during inspiration: Effect of inspiration on arterial pressure: Why: Venous: Why: As regards inspiration, when arterial tension greatest: Effect of expiration on arterial pressure: Venous: Why does arterial pressure fall at the beginning of inspiration: Rise at the first part of expiration: Explain how the cardio-inhibitory center produces rhythmical undulations of blood pressure: Vaso-motor centre: Describe Cheyne-Stokes breathing: Cause: Connected especially with what disease: Relation of venous blood to active respiratory centre: What is hyperpnoea: Dyspnoea: Asphyxia: How can asphyxia be produced: Give symptoms of asphyxia in the first stage: Second stage: Third stage: How long convulsive stage last: Third stage: Give conditions of vascular system in asphyxia: Cause of right side heart, pulmonary artery and systemic veins being gorged with blood after death: Cause of death: In what way will carbonic acid kill: Carbonic oxide: Hydrogen: Sulphuretted hydrogen: Nitrous oxide: Carbonic acid and other gases in more

than a certain proportion: Give normal condition for breathing: If the pressure is diminished one half could life be maintained: Give symptoms if pressure is reduced beyond this: Effect if increase the oxygen: Symptoms if cut off blood supply from respiratory centre: Warming blood in carotids: Cause in each case.

**FOOD AND DIGESTION.**—Object of digestion: How is food divided: How is the organic divided: Name the nitrogenized: Non-nitrogenized: How is the inorganic divided: Classes of food essential to life: Name flesh richest in nitrogenous matter: Per cent.: Per cent. in mutton: Veal: Pork: Most digestible, beef or mutton: Easiest digested, flesh of young or adult animals: Why: Why pork hard to digest: What does flesh contain: Name carbohydrates: Most important part: Give percentage composition of lean beef: Fat beef: Lean mutton: Fat mutton: Veal: Pork: Poultry: White fish: Salmon: Fels: Oysters: Young animals subsist upon what food: Composition: What is cheese: Varieties: What is cream: Butter: Buttermilk: Whey: Give percentage composition of milk: Buttermilk: Cream: Skin cheese: Cheddar cheese: Give composition of eggs: Percentage composition of the white; Yolk: Name the leguminous fruits: Amount nitrogenous matter: Name the organic non-nitrogenous foods: What does bread contain: Percentage composition of bread: Flour: Source of sugar: How take oils and fats: Composition: What minerals are essential to good health: How obtain chloride sodium: Potassium: Salts: Calcium: Iron: How is water consumed: What is the action of tea: Cause of the aroma: Composition of tea. Coffee: Cocoa: What is beer: Per cent. alcohol: What is cider and perry: Per cent. alcohol in wines: In spirits: Effect of cooking on food: In what does cooking consist: Effect of heat on meat: Beating or bruising has what effect: Action of hot water on meat: How extract the constituents of the

meat: How extract the myosin: Effect of boiling an egg: Effect of heat on milk: Action of heat on vegetables: How make dough: What is yeast: Action of yeast on dough: Cause: Action of heat during baking the dough: Mastication: What is the beginning of the alimentary canal: Give boundaries of the mouth: Into what does it open behind: What are the fauces: Kind epithelium lines mouth: Shape superficial layer: Describe the mucous membrane: Adenoid tissue: What is mastication: What performs it: How know when it is complete: Name muscles of mastication: Name muscles that elevate jaw: What does temporal mean: Masseter: Pterygoid: What muscles pull jaw down: Carry it from side to side: Bring it forward: Carry it backward: Function of the temporo-maxillary fibro cartilage: Is mastication voluntary: Name the afferent nerves concerned in mastication: Efferent: Where centre located through which the reflex actions occur.

**SALIVARY GLANDS.**—What is insalivation: Name the salivary glands: What does parotid mean: Kind glands are the salivary: Of what are they made up: Of what does each lobule consist: What are the alveoli: Give structure: Describe the epithelium: Why appear granular: Describe the fibrous connective tissue: Name and describe the ducts beginning at the alveoli: Describe the epithelium: Name the true salivary gland: Give the structure: Name true mucus-secreting gland: Give structure: What is mucigen: Mucin: Effect of a stimulant on cell: What cells are found between basement membrane and central cells: Describe cells lining tubes: Name mixed glands: Give structure: Where are nerves found in the glands: How nerves end: Describe the blood vessels.

**SALIVA.**—What is saliva: Is it a secretion: What is a secretion: Why is saliva frothy: Give properties of saliva: Specific gravity: Composition: Active principle: What nitrogenous body found largest quantity: How precipitate: Action of mineral acid on mucin:

Proof that saliva contains sulpho-cyanate of potassium: When is saliva secreted: Discharged: Quantity: How many functions has saliva: Give mechanical: Function of parotid: Function of submaxillary: Chemical action of saliva: What surrounds starch granule: Reaction with iodine: What is granulose: Reaction with iodine: Third body said to be contained in granule: Reaction: First change starch undergoes: Reaction: Name the other dextrine produced: Reaction: Saliva converts starch into what kind sugar: Test for sugar: Name those things that will facilitate the action of saliva on starch: Retard it: When do the salivary glands of children become active: Secretion of saliva is what kind of action: Excited by stimulation of end of what two nerves: Kind of nerves: Where impression carried: Where is centre located: Action of centre: Name of impulses sent back: What other stimuli may produce saliva: Give nerve supply to submaxillary gland: Kind fibres in chorda tympani: Where medulla lost: How is function of the gland influenced by cutting nerve: Stimulating peripheral extremity: Stimulating sympathetic: By cutting both chorda tympani and sympathetic: Name of the secretion: Name the vaso-motor dilator nerve to the submaxillary gland: How many sets of fibres does it contain: Function those distributed to cells: Name vaso-motor constrictor nerve to the submaxillary gland: Name nerves that influence secretion in parotid gland: Give distribution of lesser petrosal: Afferent impulses that cause secretion in submaxillary gland are conveyed through what nerves: When enters stomach what nerve conveys the impulse: Describe cells in true glands during rest: During secretion: When is ptyaline produced: By what: Out of what: When discharged: Effect of stimulating the sympathetic: Chorda tympani: When is mucigen produced: Where: Into what is it converted: Part of gland produces secretion: If cells are discharged are they renewed: Source of material from which secretion is made.



**TONGUE.**—Kind organ; How are the muscles making up the tongue divided; Other name for the intrinsic; Larger movements produced by which set; Describe mucous membrane; Part of mucous membrane peculiar; Where are the larger papillæ; In what animals are they horny spines; Function of such papillæ; Why more prominent than those of skin; Name varieties of papillæ; In a general way how are they formed; How many circumvallate; Where situated; Shape; Size; What surrounds them; Where find fungiform; Why so named; Of what else do they consist; Where find the filiform; Shape; Function as indicated by shape; Kind of epithelium on tongue; Where thinnest; Describe epithelium covering filiform papillæ; Have papillæ blood and nerve supply; Where nerves form a plexus; Where find gustatory buds; Shape; Describe gustatory cells; Incasing cells; Part of epiglottis find taste goblets.

**PHARYNX.**—What does pharynx mean; Where found; Give general make up; Name of the muscles; What lines muscles; Kind epithelium; Where find tonsils; What muscles form anterior pillar; Posterior; Describe tonsil; Kind epithelium covers surface; What bounds tonsil; Function of the viscid secretion.

**ŒSOPHAGUS.**—Other name; What does it mean; Narrowest part alimentary canal; Where begin; End; Length; How many coats; What covers muscular coat; Direction of fibres of the muscular coat; Which external; How arranged; Kind fibres above; Lower part; How muscular connected with mucous; Where find mucous glands; What mean by muscularis mucosæ; Describe the mucous coat; Peculiarity in the child; Where find nerve ganglia of Auerbach.

**DEGLUTITION.**—What is it; Divided into how many acts; What are they; What is the first; Second; Third; What act is voluntary; Do we usually take cognizance of it; What brings tongue out; Carries it back; Makes it concave; Convex; What closes mouth; Pushes bolus on tongue; Where is bolus at

end first act; Part second that is voluntary; What is the first part; By what; What pushes bolus through pharynx; What protects glottis; If epiglottis is absent; What is glottis; What protects posterior nares; Part of deglutition wholly involuntary; What is third act; Does it take place immediately; How third act influenced by cutting pneumogastric nerve; Peculiarity of lower part oesophagus after third act; Name the reflex nerves of deglutition; Motor; Where are the nerve centers situated that harmonize the muscles; What controls the movements of oesophagus; Kind act is deglutition.

**STOMACH.**—Give anatomical definition; Physiological; Where located; Give the anatomy; Name coats of stomach; What does peritoneum mean; Describe the external coat; Name layers of muscular coat; Which external; Part of stomach they are found; They come from what organ; What fibres encircle stomach; Where most abundant; What do they form; Kind figure they form; Where find oblique; What do they form around cardiac orifice; What does sphincter mean; Kind muscular fibres in alimentary canal; What separates muscular from mucous coat; Describe it; Appearance of mucous membrane; Direction of rugæ; Describe the mucous membrane; What separates glands from mucous membrane; What mean by muscularis mucosæ; Appearance of free surface of stomach examined by lens; Size of the pits; How separated; What find in the pits; Name glands found in stomach; Where find peptic glands; How arranged; How many tubes open in one duct; What lines ducts; Which in the neck; Body; What lines neck; Where find peptic cells; Other name; Do they form a continuous layer; How does body end; Where; Describe the cells; Change in glands as the pylorus is approached; What glands have longest ducts; Number tubes opening in each duct; What lines ducts; Neck and body; Change in cells during secretion; Change in glands as approach duodenum; With what

are they continuous; Changes in the cells during secretion; What are the granules thought to be; From what is pepsin formed; Where stored; Describe the lymphatics; Name arteries that go to stomach; Describe the deep capillary net-work; Superficial; From which do veins arise; Course; Terminate; What nerves supply stomach; Ganglia.

**GASTRIC JUICE.**—Functions of stomach; Appearance of mucous membrane when inactive; What covers surface; Reaction; Change when food is introduced; What will cause gastric juice to be discharged; Purest and greatest flow; How should food be introduced; How does saliva influence it; Foods that will cause greatest flow; Give properties of gastric juice; Composition; Amount secreted in a day; Cause of acidity; What other acids does it contain; Amount hydrochloric acid; Give tests for hydrochloric acid; What cells produce pepsin; Acid; Name of the cells; Why; How obtain pepsin from a mucous membrane; On what does action of gastric juice depend; General effect of stomach digestion; Describe chyme; Chief function of gastric juice; Give example; What are proteoses; Chief forms; Give characteristics of peptones; How differ from egg albumin; Into what are peptones changed in blood; Why; By what; Chief product of gastric digestion; Action of hydrochloric acid on native albumin; Parts juice necessary for digestion; Kinds peptones; Action pancreatic juice on them; Kind ferment is pepsin; First product of digestion; Give properties of proto-albumose; How does hetero-albumose differ; Give properties of deuterio albumose; What is the ultimate result of gastric digestion; Give circumstances favoring gastric digestion; Explain the digestion of fibrin; What are the products of the digestion globulins called; Vitellin; Casein; Myosin; How differ from albumoses; Included under what term; What are proteids; Action gastric juice on them; On milk; Cause of curding; What is rennet; Action on milk; Name of the fer-

ment; Action gastric juice on gelatin; Kind food digested in stomach; Action on starch and fats; Is starch digested in stomach; By what; Action gastric juice on cane sugar; Putrefaction; Time of gastric digestion; What would modify it; Contraction of the gizzard of what bird is necessary to digestion; Name three functions of the muscular fibres of stomach; Condition of orifices of stomach during digestion; When is cardiac open; Condition of pyloric during first part digestion; What does pylorus mean; When does it open; Where contraction most vigorous; Peristaltic; Function of this action of the stomach; Cause of the hour glass appearance; Kinds current in stomach; What are they; What sets up the movements in stomach during digestion; Name nerves going to stomach; Effect of cutting vagi nerves; Stimulating them; Cutting splanchnic; Stimulating them; Name vaso-motor dilator nerve to stomach; Vaso-motor constrictor; Conditions that will cause stomach to be digested; Why is stomach during life not digested; In what animals is regurgitation common; Is it physiological in man; Give mechanism; What is emesis; How are emetics divided; What is a local emetic; Centric; First thing in emesis; Next; Why take deep inspiration; How diaphragm fixed; Part stomach relaxes; Contracts; Last act in emesis; Where is nerve center located that controls nerve action in vomiting; Name sensory nerves involved; Does cerebrum have anything to do with it.

**INTESTINES.**—How intestines divided; How communicate; Action of the valve; Length of small intestines; How divided; Name of first part; Why; Give the anatomy; Second part; Why called jejunum; Give the anatomy; Name of third part; What does it mean; Relation of small to large intestines; Coats of small intestines; What is external; What layer of peritoneum; That part of peritoneum surrounding small intestines takes what name; What does mesentery mean; Describe muscular fibres in

middle coat: Kind muscular fibres: Whose plexus of nerves between muscular coats; Where find submucous coat; Describe it; What plexus of nerves find in it; Mucous coat resembles what; Name structures found in it; What are muscularis mucosae; Where valvulae conniventes begin; End; Largest; How formed; Shape; Extent; Function; Name other glands found in intestines; Where find glands of Lieberkuhn; Where largest; Where visible to naked eye; Length; Give structure of tubule; Where Bruner's glands found; Where most abundant; Situation; Give structure; Where find glands of Peyer; Greatest abundance; Two conditions meet them; Other name for Peyer's patches; Number; Length of patch; Width; As regards mesentery, where find them; How differ in structure and function from solitary glands; What are they; Describe them; Length; Situated; Which follicles reach free surface; What covers them; What surrounds gland; What connects glands in Peyer's patches; What surrounds patches; Give blood supply; Period of life patches largest; Where find villi; What are they; Length; Appearance they give surface; Where most numerous; Number; Of what does each villus consist; What covers surface; On what does it rest; Contents of inside; How cells arranged; Cause of striated basilar border; Describe the arterial supply; Veins; Muscular fibres; Name of lymphatic in villus; Why; What is the fluid; How does the lacteal begin.

**LARGE INTESTINES.**—Shape; Length; Where begin; Name; Mean; Size; What is attached to caecum; What is inflammation of it called; Give anatomy of the large intestines; Name coats; Describe the external; Name of processes containing fat; Arrangement of fibres of muscular layer; Which external; Peculiarity; Why gut puckered; Arrangement of longitudinal fibres in rectum; Describe circular fibres; Form what sphincter; What does sphincter mean; Describe mucous membrane; Bounded be-

low by what; Name glands; Describe the tubular; Lymphoid; Where find ileo-caecal valve; Function; How formed; Give arrangement of muscular fibres; How make valve disappear; Which surface covered with villi; Distension of caecum has what effect on valve.

**PANCREAS.**—Give meaning; Other names; Where situated; Give anatomy; Resembles what gland in structure; How differ; Give arrangement of ducts; Describe the epithelium; Alveoli; Describe zones; Change during digestion; From what are granules formed; By what; When; What are these granules; Describe the other variety of cells; How do nerves terminate in pancreas; How obtain pancreatic juice; How make it from gland; Exposure of gland to air increases what ferment; When is zymogen converted into a ferment; Action of dilute acids; Give properties of pancreatic juice; Variations in specific gravity; Solids; Composition of fluid; Is it a secretion or excretion; When produced; By what; Out of what; When discharged; Function of tripsen; Acts like what gastric ferment; How differ; What focal substances are sometimes produced in pancreatic digestion; How are these products produced; Action pancreatic juice on gelatine; Tripsen acts in what kind of medium; Which most powerful, tripsen or pepsin; Function of amylopsin; Acts like what other ferment; What is rennet; How obtained; How differ from tripsen; Function of steapsin; What mean by emulsion; Chemical or mechanical; Color; Absorbed by what vessels; Composition of oil; Action of heat and alkali; Can pancreatic juice produce same action; Does it usually take place in organism; In pancreatic troubles kind diarrhoea might have; Why; Conditions favorable to the action of pancreatic juice; Give nerve mechanism; Amount secreted in a day.

**LIVER.**—Largest gland in body; Situation; Give the anatomy; Blood supply; Blood is returned by what vein; What becomes of bile after production; What



vessels in liver run by themselves: What surrounds liver: Where peritoneum absent; Where capsule thickest: Size lobule liver; Structure; What fills interstices of these vessels: Function of cells: Size: Structure of cell: Kind movement have cells; How cells held together; Name branches of portal vein in liver: Why called portal; Origin: Bile secreted from what blood; Proof; Give branches of hepatic vein: Into what does it empty; Name of artery going to liver: Branches in liver; Arrangement of hepatic ducts: What lines them: Where bile capillaries begin: What bounds them: Situation of gall bladder: Shape: Function: When distended with bile: What is duct from it called: With what unite: What form: Into what does it empty: Where; Give coats of gall bladder: Where serous absent; Give structure of middle coat; Internal: Peculiarity of mucous membrane in cystic duct; Where find mucous glands: Name function of liver; Is bile secretion or excretion: Name excretory part; Give properties of bile: Chemical composition: Per cent. of water in bile: Bile salts: Other name: Give properties; Name bile acids: Salts: How formed: How prepared: Upon what do the recrementitious functions of bile depend: Give Pettenkofer's test; Name of coloring matter of bile: When have biliprasin; Test for bilirubin: Origin coloring matter; Other pigments about same as bile: Amount bile secreted in a day: What becomes of it: What becomes of the part not used in digestion: What is cho'emia; Where does the blood get it: Intestines: Ducts: Cells: Out of what; When: Why is bile discharged continuously: What will retard it: Increase it: How does bile get into gall bladder: What does the blood do with the bile absorbed from intestines: If the blood doesn't destroy it what is produced: What is jaundice: How many kinds: Cause of Hematogenous jaundice: Treatment: Cause of hepatogenous jaundice: Treatment: Name fatty substances: Function: Origin mucus: Action of ma-

case: Name inorganic constituents: Gas: Name functions of bile: Is bile essential to life: Without it die with what symptoms: What is composition of meconium: Function of bile in fetus: Amount of bile discharged by foetus: Urobilin: What becomes of the carbon and hydrogen of bilin: Change the acids may undergo in intestines: Part of bile is an excretion: What is cholesterine: Carried to liver by what blood: How held in solution in blood: Bile: What is cholesteremia: What is stercorin: When discharged as such: Amount: Name other excretory function of liver.

### **GLYCOGENIC FUNCTION OF LIVER.**

Proof that sugar is found in liver: What is glycogen: Source: How would fasting influence the glycogen in the liver: Diet of animal food: Vegetable: Starch and grape sugar: Cane sugar: Diet most favorable: Give two theories of destination of glycogen: Function of glycogen found in muscles, etc.: Give relation of glycogen to cell metabolism: What is glycosuria: Injury of what nerve center would produce it: What animals liable to have sugar in urine: Source of it: How nervous influence is not carried by vagi or splanchnics: Vaso-dilator effect: Drugs that might cause it: To what is the glycosuria due: What is diabetes: Diabetes mellitus.

**FORMATION OF UREA.**—What is leucin and tyrosin: How formed: Reason for thinking they are converted into urea by liver: How: Why think liver can form urea from ammonia: Second source of urea in urine: What is creatin: Does it appear in urine: Amount produced: Do muscles produce urea: Active principle of urine: How convert creatin in urea: Organ that probably converts creatin into urea: Why diet of proteids increase amount of urea: Is urea formed from uric acid: See page 467.

**SUCCUS ENTERICUS.**—What produces it: Properties: Composition: Functions: What is invertin.

**SUMMARY.**—What is digestion: Where begin.

Chemical change in mouth; Mechanical; Class of food digested in stomach; Is starch digested in stomach; By what; Function of stomach; Condition of food when discharged in duodenum; Name; Reaction; Mixes with what juices; After mixture reaction; To what point remain alkaline; Action of bile on chyme; Pancreatic juice; Why albuminous matter absorbed largely by lymphatics; How many fluids digest starch; Cane sugar; Proteids; Action of succus entericus; Color chyme lower part small intestines; Odor; Cause; Nature of chyme after going through ileo-caecal valve; Name of the changes in chyme in large intestines; Why think fats absorbed in small guts; Reaction before getting in big gut; After; Why think chemical changes take place; Does digestion take place in large gut; Proof; Changes of chyme in large gut; Chief function of large gut; Largest what animals.

**ACTION OF MICRO-ORGANISM IN INTESTINES.**—To what are changes in intestines independent of ferments due; What mean by organized ferment; Name typical one; Give action of yeast plant; Speaking generally, give action of cell; Describe the bacteria in the mucous membrane; How multiply; Size; Classification morphologically; In what other places are bacteria found in alimentary canal; In what part are the changes, due to bacteria, greatest; What is formed from peptone; What becomes of them; Name other products; Origin of acids.

**MOVEMENTS OF INTESTINES.**—What is peristalsis; Antiperistalsis; Explain contraction and function of longitudinal muscular fibres; Circular; Kind movement; When perceptible; What prevents passage of large guts into small; What prevents dilatation of orifice; Change in muscular fibres of large gut as go down; Where strongest; Why; Number sphincters; Name; What forms internal; External; Which striated; Action of brain on movement of bowels; Cord; Pneumogastric; Action of chyme on

movement; If empty will intestines move; Nerves distributed to guts; Nerve mechanism same as what other organ; Time food is in passing through small guts; Large; Faeces: On what does consistence of faeces depend; Amount fecal matter in day; Composition; Per cent. of water; Source of water in stomach and bowels; Name gases found in intestines; Source carbonic acid; Hydrogen; Carburetted hydrogen; Nitrogen.

**DEFÆCATION.** — What is it; Cause; Give mechanism of the voluntary part; Condition of external sphincter; Situation of nervous center controlling this action; Proof; Cause of desire for evacuation; Sensory impression act through what part; State double action of center; Smallest part large intestines; Name; Why think fecal matter does not accumulate in rectum; Function of sigmoid flexure.

**ABSORPTION.** — What is it; Where begin; End; Carried on by what vessels; Consists of how many processes; What are they; Conditions for absorption from alimentary canal; Give two old ideas; Present; Reason; What is an endosmometer; Describe it; What is osmosis; How many currents; Names; Give example of membrane influencing osmosis; State conditions for osmosis; Are these present in absorption from alimentary canal; Explain; Give rationale of action of sulphate magnesia; Absorption of chyme; How is osmosis affected by hydro-chloric acid; Character of crystalloids; Colloids; State other differences between them; Example of each; What does filtration mean; What will effect it; Example; Give example of osmosis and filtration; Getting rid of effusion by absorption is based on what principle; Character of medicine given; What mean by hydragogue cathartics; Diaphoretics; Diuretics; Give rationale of action; Give rapidity of absorption; Example of absorption being more rapid from rectum than mouth; Variations of absorption; Conditions influencing absorption; Fluid easiest absorbed; Why would

bleeding increase it; Rapid circulation; Give vital cause; Proof.

**LYMPHATICS.** — Function of lymphatics; Resemble what vessels; With what are lymphatics provided; How do lymphatics begin; End; Into what do these two ducts empty; Course of fluid in lymph vessels; Where thoracic duct begin; What is beginning called; Where end; Describe ductus lymphaticus dexter; Receive what vessels; Into what does it empty; Where find lacteals; Why called lacteals; What do they contain during digestion; Through what do lymph vessels pass; Where have lymphatics not been demonstrated; Give origin of lymph capillaries; Origin of lacteals; Give structure of lymphatic capillaries; How differ from blood capillaries; Communications of lymphatics; Name some large lymph spaces; How connected with lymph capillaries; What mean by pseudostomata; How demonstrate lymphatics in diaphragm; What lymphatics open in anterior mediastinum; Posterior; Action of diaphragm on the circulation; Describe the coats of lymphatics; Valves; Why lymphatics appear beaded; Cause of lymph flow; Where find lymph heart; Through what do most lymph vessels pass; How many glands in the body; How divided; How superficial arranged; Name peculiar glands; Why; Shape of gland; What surrounds them; Where send in trabeculæ; Parts make up glands; Color of each; Where find alveoli; Where is the proper gland structure; How arranged in cortex; Describe endothelium in central mass; Describe frame work of the adenoid tissue; Structure of lymphatic gland resembles what other gland; Name of lymph vessels going to gland; Describe the termination; Where efferent vessels begin; Where leave gland; How many; Where blood vessels enter and leave gland.

**LYMPH.** — What is lymph; Give properties; Kind corpuscles; Why does lymph vary; Effect if exposed to air; Peculiarity of lymph in thoracic duct; What is chyle; To what is the whiteness and opacity

due: Composition of a molecule; Proof; Kind fluid molecules float; Change chyle undergoes in passing through mesenteric glands; What are chyle-corpuscles: Where will chyle coagulate spontaneously. How clot differ from blood-clot; Relation of clotting to corpuscles; Composition of lymph resembles what other fluid; Difference between lymph and chyle; Give chemical composition of lymph; Amount of lymph; Where is absorption most active; Why; Fats absorbed chiefly by what; Function of lymph corpuscles in absorption of fats; Explain how absorption is assisted by pressure; What secretions will assist absorption fats; What is lymph; Source; Characters of lymph; Resemble what; What is absorbed by blood-vessels; Where is absorption most active. Can absorption take place by skin; Proof; Can water be absorbed by skin; In dysphagia how can thirst be satiated; Why sailors immerse themselves in salt water; Can absorption take place in lungs.

**KIDNEYS.**—What is an excretion; If not eliminated what trouble; Principle organ of excretion; How many kidneys; Where found; Size; Covering of kidney; With what is it continuous at hilum; Two parts that make up kidney; Other name for medullary; What is pelvis; What are calyces; What does each of these cups receive; Give anatomy of kidneys; Origin of nerves of kidney; Size ureter; Length. What does it form above; Into what does it empty; Name the coats; Describe external; Middle arranged in how many layers; Which circular; What is internal layer; With what continuous; Kind epithelium lines it; Describe it; Where find bladder; Shape; Size; Function; Where is fundus; With what is cervix continuous; How many coats; What is external; Where incomplete; What is middle coat; Which layer is circular; What form; Describe submucous; Mucous coat; Where peculiar; Kind epithelium lines it; Where glands most numerous; How is blood supply; Describe the nerves.



**URINE.** Give properties; Amount; Composition; Amount water; Reaction of urine; Is there free acid in urine when discharged; After standing cause of the acid; Change urine if allowed to stand; Cause; Change urea undergoes in the conversion to ammonia; What will be deposited; Upon what does the amount of water depend; What is diabetes; How amount urine influenced by fever; How estimate solids of urine; Give variations in specific gravity; What is *urina sanguinis*; *Urina potus*; *Urina cibi*; Urine to be selected for analysis; Name some of the abnormal constituents; Principle solid constituent or active principle of urine; Properties; With what is urea isomeric; What is isomeric; How can urea be produced artificially; Amount urea excreted in a day; On what does amount depend; Give methods of estimating quantity; Is uric acid ever absent from urine of man; Properties; Amount; Variations in quantity; Kind food would increase it; When and where deposited; In what condition does it exist in urine; How render urine acid; Where urates formed; Give properties of uric acid; Tests; Where find hippuric acid; Diet that would increase it; Properties; Name pigments of urine; Cause yellow color of urine; What is urobilin; Where abundant; Origin; What is uro-erythrin; Uromelanin; Indican; Source of mucus; Where abundant; Why make urine alkaline; Name the extractives; Condition of the sulphuric acid in urine; Origin; Origin of the sulphur; Condition of phosphoric acid in urine; Kind phosphates in blood; Urine; Why acid in urine; Origin phosphates; Function phosphate lime; What furnishes phosphorus for urine; When earthy phosphates most abundant in urine; Exercise increases which phosphates; When are phosphates deposited in urine; Name; Origin of the ammonia; How does chlorine exist in urine; Name occasional constituents; Gases; Is urine secretion or excretion; How urine produced; Parts of urine separated from blood by malpighian corpuscles; Rela-

tion of blood pressure to it; Name those things that will increase urine by increasing blood pressure; Increase the urine without increasing blood pressure; Name things would diminish urine; Relation of kidneys to skin; Function of epithelium in malpighian corpuscles; Kind epithelium in convoluted tubes; Other parts; Where urea separated from blood; Influence of blood pressure on it; If the epithelium is destroyed is it reproduced; It is exfoliated in what trouble; Cause of urine passing into pelvis of kidney; Describe the way in which urine enters bladder; What causes it to pass through ureters; Position of body most favorable; What prevents regurgitation from bladder to ureters; What is micturition; Give mechanism of the voluntary part of micturition; Involuntary; Cause of the sensation; Situation of centre controlling bladder; Give example of micturition caused by reflex action; Give nerve mechanism of micturition.

**SKIN.**—Give functions of skin; How many layers has skin; Names; Name organs found in and beneath the skin; Appendages; How many layers of cells in epidermis; Describe the stratum corneum; Stratum lucidum; Stratum granulosum; Rete mucosum; Columnar epithelium of the deepest layer of malpighian; What becomes of the old cells; Cause of epidermis getting thick; Function; What is cutis vera; On what does it rest; Give structure; Where papillæ most prominent; Arrangement; Average length; Describe the blood supply; What nerves terminate in papillæ; Name glands of skin; Which most abundant; Number in skin; Describe the general appearance of sweat gland; Part skin duct is spiral; Straight; What lines duct; Describe epithelium in coil; Where glands most numerous and largest; Where find odorous glands; Describe them; What is cerumen; Name of glands that produce it; Describe them; Where find sebaceous glands; Most abundant; Absent; Kind glands; Give structure; How many glands to the hair.

**HAIR.**—How are hairs divided; Where find long; Short; Downy; From what is hair produced; Describe the cuticle of the hair; Layer beneath cuticle; Medulla; What forms hair follicle; Describe it; On what does hair rest; What is root-sheath; Function of hair.

**NAILS.**—From what formed; Has how many layers; Describe the under one; What is matrix; What is root; What receives it; What is bed of nail; Appearance; How do nails grow; In what direction; Where nail thickest; Why; Function of nails.

**FUNCTIONS OF SKIN.**—What is perspiration; When produced; What mean by insensible perspiration; Sensible; When given off in the form of vapor; Describe sebaceous matter; To what is peculiar odor due; What is vernix caseosa; Function; Give chemical composition of sweat; Properties; Amount of water excreted in a day; Amount per minute during rest; Name conditions that will affect it; Amount carbonic acid exhaled by skin; Relation of sweat to blood supply; Where are sweat centres located; Give example of increasing sweat without change of blood supply; Increase blood supply and no sweat; Cause of sweating in consumption; How does pilocarpin act; Strychnia; Picrotoxin; Nicotin; Give other functions of skin.

**MUSCULAR METABOLISM.**—Weight of muscles; Principal substance can be extracted from muscle; Cause of coagulation of muscle after death; What is muscle-plasma; Describe coagulation; Into what separate; What is the muscle clot; How differ from fibrin; What is it; How prevent muscle coagulation; To what is muscle clot due; What is myosinogen; Composition; How obtain myosin from dead muscle; Peculiarity of it; Give properties of muscle serum; Name three proteid bodies it contains; Give properties of each; What obtain from red muscle; Name ferments; Acids; Carbohydrates; Nitrogenous crystalline bodies; Salts; When mus-

cles contain elasticity; Changes in muscles during rest; If muscle is separated from body in what gas will it longest retain its contractility; Reaction of living muscles in a resting condition; How long can electric currents be demonstrated passing through muscles after separation from body; Cause of the currents; What would diminish them; Increase; What is necessary for the current; Function of muscle; Proper stimulus; Reasons for thinking contractility is inherent in muscles; What will cause a muscle to lose its irritability; Proof that arterial blood affects it; Cause of cessation of heart in asphyxia; Stimuli may be applied to muscles in what ways; Number; Explain mechanical stimuli: Thermal; Chemical; Electrical; Kind current usually chosen.

#### **SINGLE MUSCLE CONTRACTIONS.**

What mean by muscle curve; Latent period; Stage of contraction; Stage of elongation; Stage of elastic after vibration; What is tetanus; How must stimuli be applied; Pathological cause; How estimate muscular work; What mean by loaded; How estimate power of a muscle; How determine in man; What mean by fatigued muscle; Effect of stimulus applied to exhausted muscle; Name accompaniments of muscular contraction; Cause of heat; How demonstrate sound; Give changes in shape; Chemical changes; Electrical changes; Describe contraction in striated muscle when stimulus is applied to the motor nerve; Non-striated; How illustrate the difference; Why think contraction of unstriped muscles depend upon their connection with nerves and ganglia; Name places where contractions are slow and feeble; Quick; How long do muscles retain power of contraction.

**RIGOR MORTIS.** What is it; When occur; Position fix limbs; Reaction of muscles; Cause; Other changes; What will hasten rigor mortis; Cause of rigor mortis; Name stages; Is restoration possible after first and second stages; Third; Cause of relaxation after rigor mortis; Part first affected in rigor

nortis: Last: When does rigidity ensue: What will cause it to speedily occur and depart: How influenced by paralysis: Does it affect both kinds muscles.

### **ACTION OF VOLUNTARY MUSCLES.—**

Function: How many kinds levers in human body: Explain and illustrate first kind: Second: Third: Muscles required in walking: Explain mechanism: Running: Give arrangement of involuntary muscular fibres: What does contraction cause: Exception.

### **ELECTRICAL CURRENTS IN NERVES.—**

What are natural nerve currents: With what do they correspond: What mean by equator: Currents of action: Explain rheoscopic frog: What is necessary for nerves to act: Nature of the stimuli: What has distance to do with the strength: Effect of constant current on muscle: If ascending where should anode be: Descending: What is electrotonus: Catelectrotonus: Anelectrotonus.

**MUSCULAR CHANGE.**—If muscle is at rest does it respire: What does it give off: How would activity affect carbonic acid exhaled: Rigor mortis: Other things produced by muscle during rest: Activity.

**GLANDULAR METABOLISM.**—Function of gland cells: Those serving some purpose in the economy take what name: Those discharged: Do secretions pre-exist: Produced by what: Out of what: When: Source of excretions: Picked up by what fluids: Where carried: If not eliminated what trouble: What mean by vicarious elimination: When do we have it: What does every secreting apparatus possess: How secreting organs divided: Name them.

### **SEROUS AND SYNOVIAL MEMBRANES.**

—How many kinds serous membranes: Name: Kind sac serous membranes form: Exception: Relation to the viscera: How many layers: What have between them: Exception: Kind epithelium covering serous membrane: Give structure: Function connective tissue: Where absent: What is always present in mem-

brane; Function of serous and synovial membranes. Amount fluid secreted by serous membranes; Relation of opposed surfaces; Why large quantity of fluid in serous sac after death; Composition of serous fluid. Give properties; How produced; How cephalorachidian fluid differ; How differ from other fluids. Describe synovial fluid.

**MUCOUS MEMBRANES.** Where find mucous membranes; Describe the appearance; To what is external surface attached; Principal tracts lined by it; Where digestive tract begin; End; What does respiratory include; Genito-urinary; Parts that are common to most mucous membranes; Describe primary or basement membrane; Describe cells; What is mucus; Properties; Composition; What produces it; Function.

**SECRETING GLANDS.**—Give general plan structure; Name tubular; How formed; Describe compound tubular; How formed; Name some; Describe aggregate or racemose; What mean by tubuls; Acinous; Tubulo racemose; How differ; How acini formed; Arrangement of acini; All have what common arrangement; Name the essential points that are alike in all secreting glands; Give physical processes of secretion; Chemical; Give two reasons; How are cells nourished; After they are perfected what becomes of them; When secretions discharged; Name glands that discharge secretion when produced; After discharged into ducts what will affect the further course of the secretion; Name circumstances influencing secretion; Relation of blood supply to secretion; One way nervous system will affect it; What mean by trophic influence; Reflex action; Conditions of brain that would affect it; Explain relations between secretions.

**MAMMARY GLANDS.**—Why so called; Where found; Give anatomy; Of what are the glands composed; Into what are lobes divided; How held together; How many ducts; Name; Where dilated;



Name; Function; Give structure of ducts; What lines them; Describe the alveoli; Give anatomy of nipple; Other name for it; How is blood supply; What find on surface; What is areola; Color; How is blood, nerve and lymphatic supply; Describe cells lining alveoli during secreting periods; Next stage; What are colostrum corpuscles; Change mammae undergo at end lactation; Condition when it is completely inactive; Describe change during pregnancy.

**MILK.**—Give properties; What are milk globules; Size; What is colostrum; Function; How differ from milk; Composition of milk; Amount of water; Specific gravity of milk; Amount milk secreted by a woman; Cow; Name proteids of milk; How obtained; Action of caseinogen with ferments; If milk is boiled what coagulates; What is nuclein; Describe the fats; Change it undergoes; What is butter; What is lactose; Peculiarity; Chief salt of milk; Function; Other salts; Name gases.

### **METABOLISM OF VASCULAR GLANDS.**

—Name these glands; Name largest one; Other name; Give the anatomy; What surrounds spleen; Give structure of the capsule; What mean by trabecule; Stroma; Where find spleen pulp; Describe spleen pulp; Describe arteries; Into what do the arteries empty; Describe the veins; Describe malpighian corpuscle; What does cytogenous mean; Describe blood supply in corpuscle; Function of spleen; Is spleen necessary for life; Cause of enlargement of spleen during digestion; Effect of cutting splenic nerves; How can contraction be brought about; What drugs; Cause of the rhythmical contraction.

**THYMUS.**—What does it mean; Where found; Kind organ; Describe it; Give structure; Function; Function in hybernating animals.

**THYROID.**—Why so called; Where situated; Give the anatomy; What surrounds gland; What passes in from capsule; What surround; Describe a vesicle; Changes they undergo by age; Describe the

blood supply; Give contents of vesicles; Function of thyroid gland; Trouble if removed; What is enlargement of it called; Cause of bulging of the eyes.

**SUPRA-RENAL CAPSULES.** Where found; Give anatomy; Give structure; What is zona glomerulosa; Zona fasciculata; Zona reticularis; Describe the medullary substance; Describe the nerves; Composition of the gland; Function.

**PITUITARY BODY.** What does it mean; Where found; Give anatomy.

**PINEAL GLAND.** Where found; Give structure; Function; Give structure of cecygeal and carotid glands.

**ANIMAL HEAT.**—Most important results of metabolism; Average temperature of man; Birds; Relation of temperature to blood supply; What organs temperature highest; Why; Where temperature lowest; Period of life temperature highest; Sex; Period of day; Exercise; Climate and season; How influenced by food; Disease; Relation of temperature to surrounding medium; What mean by cold-blooded animal; Source of the heat in body; What is produced; Relation of heat to changes; What is necessary for the protoplasm to perform function; What two changes are constantly going on in organism; Explain how heat is produced by these; How prove that the heat of the body is produced by chemical change; Name the chemical axiom; Does this hold good with proteids; Why not; How estimate the amount of heat produced; What mean by caloric.

**HEAT-PRODUCING TISSUES.** Name chief heat-producing tissues; What always accompanies muscular contraction; When is carbonic acid produced by muscles; Relation of the amount of heat produced by muscular activity to that of the body; Why think heat produced in glands; Most in what gland; Why think heat produced in brain; What tissues produce heat; Is heat produced in blood; Part that friction plays.

**VARIATION IN HEAT LOSS.** Relation between heat loss and heat production: How does the body lose heat; Amount lost by warming food and drink; Heating inspired air; In evaporation; Radiation and conduction; How does it regulate temperature; What controls the blood to the skin; Action of hot atmosphere; Cold; Kind weather heat evaporation is great; Small; Radiation; Explain how a high temperature can be endured for a short time; Organ second in importance to the skin in lowering the temperature; Temperature of air expelled from the lungs; When is heat loss greatest as regards air; Kind clothing worn in summer; Winter.

**VARIATION IN HEAT PRODUCTION.**—On what does the amount of heat produced depend; If katabolism is great how is heat production; Tissue change is greatest in what animals; Effect of digestion on temperature; Food that would most increase it; Climate; Effect of exercise; Why think heat production is influenced by nervous system; If the nerve to a limb is cut how is temperature influenced; How does nervous system influence temperature; Relation of cold to metabolism in warm blooded animals; Cold blooded; Where are the heat centres supposed to be situated; What organ communicates with it; Relation of fevers to metabolism; Temperature; Changes in temperature produced by external cold or heat compatible with life.

**NUTRITION AND DIET.**—What is necessary for the natural functions should continue: What is this call on part of system; How do lower animals take food; Man; Object of the food introduced; How calculate the amount necessary to be introduced; Composition of the excreta; How balance this waste; Name excreta with amount eliminated by lungs; Skin; Urine; Faeces; Amount of carbon lost from whole organism; Nitrogen; Proportion of carbon to nitrogen in proteids; Why should the diet be mixed; How long will an animal live, deprived of food; Most nota-

ble effect of starvation; When greatest; The loss of what per cent. will cause death; Effect of starvation on temperature; Reduction of how many degrees of the temperature will cause death; What is death by starvation; Effect of heat applied to animals dying from starvation; Symptoms produced by starvation; How long will man live without food; Effect of starvation on excreta; Urea represents what loss; Appearance after death; The only income in starvation; Effect of proteids given during the period of starvation; What is nitrogenous equilibrium; What becomes of the carbon in the meat; Would body increase or diminish in weight; Flesh; What mean by morphatic or tissue proteids; Circulating or floating; How latter changed into urea; What is *luxus consumption*; How long can this continue; Trouble if liver strikes work; Trouble in lithiasis; When nitrogen retained in body; Relation of the increase in weight to nitrogen retained; Carbon.

**NON-NITROGENOUS.** Effect of feeding on one or two kinds of food; Sugar and water; How long live; Effect of gum; Symptoms when fed on oil and water; Is gelatin nutritious article of diet; It will take the place of what proteid; When are fats or carbohydrates retained as fat; If proteids are increased what takes place; Might body lose in weight; Effect of excess of carbohydrates; Excess of fat; Action of peptones; How prove salts necessary; Conditions that will cause loss of flesh; Remain stationary; Gain; Increase with gout; Function of fat and carbohydrates; Gelatin; Most important salts; How long live without water.

**NORMAL DIET.**—What makes a normal diet; Conditions to be considered in making normal diet; Amount of lean raw meat necessary for average meal; Bread; Food for infant; Amount; Kind food for warm climates; Hard labor; Fattening diet; To reduce obesity; Increase muscle; For training; Brain work.

**INCOME AND OUTPUT OF ENERGY.—**

Objects of food; What is a caloric; Foot-pound; Mode of motion; How much heat must be produced; What would the energy daily manifested include; Amount heat produced in a day; What must be added to the foregoing; Explain influence of heat and light of sun; Describe how protoplasm convert food into energy; Food necessary for it; Are the salts essential; What is sarco-lactic acid; What becomes of it.

**LARYNX.**—What does it mean; What is voice; Speech; Cause of the sound of the human voice; What does glottis mean; Rima glottidis; How voice affected by an opening in trachea; Above vocal cords; Give structure of vocal cords; Give anatomy of larynx; How muscles divided; How intrinsic divided; Name abductors; Adductors; Sphincters; Tensors; Give nerve supply; Function superior laryngeal; Inferior; Shape of glottis in tranquil respiration; Deep inspiration; Condition of cords on emission of a note; When most tense; On what does range of voice depend; When cords brought into sight; Depressed; How does epiglottis modify sounds; When are cords nearest together; Where true sounds produced; What is the first mode of sequence of laryngeal notes; Second; Third; This comprehends how many octaves; As regards octaves, difference between male and female voice; Principal difference; Name different kinds voice; Explain each; What mean by tone or timbre; What mean by barytone; Mezzo-soprano; On what does pitch depend; Tone or timbre; Appearance of boy's larynx; Length cords before puberty; Boys have what kind voices; What mean by crack; In what individuals does voice undergo no change; Peculiarity of voice of old people; Cause; What mean by chest notes; Falsetto notes; On what does the strength of voice depend; On what does the loudness of a given note, with maintenance of the same pitch, depend; Condition of arches of palate and uvula during high note; Function of ventricles

of larynx; What constitutes language; Where are vowel sounds produced; Consonants; Explain ventriloquism; Action of tongue in speech; On what does stammering depend.

**THE NERVOUS SYSTEM.** Of what does it consist; Function of nerve fibre; What will cause them to act; Can fibre originate; Upon what does the effect depend; If stimulus applied midway between ends of nerve, direction of current; Effect of stimulating a cerebro-spinal nerve in living body; What does change in nerve cells of brain cause; If stimulus applied to a nerve and the impulse is carried to centre, what does it cause; Periphery; Do nerves act both ways; As regards function, how are nerves divided; Sensory act in what way; Other name; What will paralyze it; Motor act in what way; Other name; What will paralyze it; What does intercentral mean; What may occur when impressions are made on centripetal nerves; Centrifugal; Does impression pass from one fibre to another; Why not; Rapidity of impulse in motor nerves; Sensory; Name conditions that would modify it; What mean by cerebro-spinal system; Sympathetic; How do cerebro-spinal centres differ from nerve trunks.

**FUNCTION OF NERVE CENTRES.** - What does reflex mean; Stimulus is carried to center through what nerve; Effect; Energy or impulse sent out over what; To what are efferent nerves distributed; Name change effected by impulse; Depending on what; What are reflex movements independent of sensation called; What does sensori motor mean; What is necessary for reflex action to occur; Relation of volition to reflex actions; Object of reflex action in health; How does contraction produced by reflex action differ from those due to direct stimulation; If irritation is slight where is the contraction; Strong; Where contraction greatest; Give law of radiation; In simplest form of reflex action what is concerned; On what does the reflex effect produced by stimulus applied to



a sensory surface depend; Time of reflex action; What is necessary for nerve center to discharge afferent stimuli; Exception; Name of such a centre; What mean by inhibition; Give example of inhibition; From where does impulse come; Name of such a centre; What mean by augmentation; Give example; Name membranes spinal cord; What does dura mater mean; Give structure; Meaning of arachnoid; Give arrangement; What does pia mater mean; Describe it; Describe tissue between pia mater and arachnoid; What are paccionian bodies.

**SPINAL CORD.** — Shape; Location; Length; Weight; Extent; Enlargements; What is filum terminale; Cauda equina; Where is cord white; Gray; How is gray arranged; How connected; What have in center; Into what does it open above; What lines canal; Name fissures; Extent anterior; What does it receive; Extent posterior; What fills posterior; How cord divided; How each half divided; Boundary anterior column; Lateral; Posterior; Shape gray matter of cord; Describe anterior cornua; Posterior; What connects gray matter; How many gray commissures; What makes up white matter of cord; What is neuroglia; Cause of enlargements in cord; Where white matter of cord greatest; Why; Why think nerve fibres terminate in cord; Of what does gray matter of cord consist; Name of fine plexus; What is substantia gelatinosa centralis; Lateralis; Where find large multipolar cells; Describe them; Where most numerous; Motor or sensory; What arises from them; Where find small multipolar; Describe them; Describe the lateral reticular formation; Posterior; Name and describe the other two groups of cells; Describe the column of Burdach; Goll; Change that occurs in fibre if separated from centre; What mean by descending degeneration; Ascending; Describe the crossed pyramidal tract; Uncrossed pyramidal tract; Antero-lateral descending tract; Comma tract; Postero-median column; Direct cerebellar tract; Tract of Gowers and Tooth; Tract of Lissauer.

**SPINAL NERVES.**—How many pairs; Name roots; Which larger; What find on it; Where; Where roots unite; What form; How nerve get out; Into what does it divide; Origin anterior root; Posterior; Kind fibres in anterior root; Posterior; How anterior enter cord; Course of internal; Middle; External; How does posterior root enter cord; Describe the inner; Lateral; Shape of cord in different regions.

**FUNCTION OF SPINAL NERVE ROOTS.**—Function anterior root; Proof; Posterior; Proof; What fibres found in anterior besides motor; Cause of motion when proximal end of posterior root is stimulated; Cause of pain when distal end of divided anterior root is stimulated; Function of ganglia on posterior root; Proof.

**FUNCTIONS OF SPINAL CORD.**—Name functions; Only way impression can go from brain to extremities; Vice versa; What is paraplegia; Cause; Where is their loss of motion and sensation; How are sensory impressions conveyed to cord; How carried up to bulb; Symptom if posterior external column is cut; Where is direct cerebellar tract; Goes through what body; How are painful sensations conducted; Pressure sensations; Muscular sense impressions; How motor impressions conveyed from brain; Which side; Where decussate; Where motor fibres of leg pass; Where is the apparatus for co-ordinated movements located; What will set it in motion; Symptom if anterior pyramids at medulla is cut; Symptom if there is division above decussation; If cut below; Kind motion have if cord is cut; Kind reflexes in man; What will set up the cutaneous; Where can they be demonstrated; What mean by plantar; Gluteal; Cremaster; Ocular; In what persons easiest elicited; What is muscular reflex; Best known; Describe it; Cause; Can reflex action be inhibited; Example; Give example of more or less controlling reflex action; Relation of reflex action to the stimulus; Exception; Give mechanism of the action of the

centre of defæcation: Where centre located; Is it voluntary; Where centre of micturition located; Give mechanism of action; Where genito-spinal centre located; Give mechanism; Where is centre for the erection of penis; Mechanism; Where is center of parturition located; Give mechanism; Give centre for the movements of lymphatic hearts of frog; Centre for tone of muscles: How is tone of muscles if animal is killed by injury of brain; How tone of muscle differ from other tissue; Give other phenomena of reflex action; What controls nutrition of muscle; Disease of what cells will cause muscle to atrophy; How are bones affected; To what is this influence of cord due; What other fibres in cord.

**BRAIN.**—Give the anatomy; Give distribution of gray matter.

**MEDULLA OBLONGATA.**—Other name; Where find it; Give the anatomy; Give the direct connections of the bulb with cerebrum and cerebellum; Indirect; Give distribution of internal arcuate fibres; External; Direct lateral fibres; Fibres from olivary body; Arciform fibres; Name functions of bulb; Function as a conductor; Reflex action; Automatism; Effect of removing brain from above and cord from below the medulla on life; Wound in what part of medulla will cause immediate death; Cause of death in fracture or displacement of upper cervical vertebræ.

**SPECIAL CENTRES.**—What are the majority; Name the bilateral reflex centres; Automatic centres; Control centres; Tonic centres.

**CRANIAL NERVES.**—What mean by cranial nerves; Which one arises out of cranium; How many pairs of cranial nerves; Name them; Apparent origin; Name nerves according to their function; Other name for third; Why; At its origin kind nerve; Distribution; What does third supply; How does it supply iris and ciliary muscle; Function of third; Symptoms if cut; Stimulated; Other name for fourth; Origin; Distribution; Symptoms if cut; Stimulated;

Kind nerve; The other name for fifth; Why called trifacial; Resembles what kind nerves; Name the roots; Which motor; Sensory; Large; Small; Peculiarity of posterior root; Name of the ganglion; What conclude when see ganglion on nerve; Origin of the fifth nerve; With what does motor root unite; How get out; What does it supply; What is nerve of mastication; If cut what happens; What are the symptoms if stimulated; Why think the buccinator receives a motor filament from fifth; What are the branches of the Gasserian ganglion; To what distributed; What is the sensory nerve of the face; Proof; How does the sensory root influence muscular movements; With what nerves does it communicate; Why; How influence iris; Name the trophic influence of the fifth; Why have purulent inflammation; Why taste partly destroyed; Name nerve of taste to anterior part of tongue; Name nerve of sensation to tongue; Other name for the sixth nerve; Kind nerve; Where arise; What does it supply; Symptoms if stimulated; If cut; Other names for the seventh; Why called portio dura; What does portio mollis mean; Intermedia; Kind nerve is the facial; To what distributed; What is the motor nerve of the face; What other function has it; What does paralysis mean; Symptoms if the facial is cut; How is eye affected; Hearing; Why; Smell; Why; Where must the injury be if taste is affected; Give the appearance of face when facial is cut; Why does food lodge between cheek and gums; Other name for eighth nerve; Kind nerve; Where arise; To what distributed; Function; Other name for ninth nerve; What does it mean; Origin; Kind nerve; Distribution; To what are the motor fibres distributed; Function of sensory fibres; What special sense is contained in it; To what part of tongue; Other names for tenth nerve; What do they mean; Origin; Peculiarity of the nerve; Kind nerve at origin; Distribution; Name communications; What does it receive from spinal accessory; Function of pharyn-

geal branch: Pharyngeal branch helps to form what plexus; Source of motor filaments in plexus; What does plexus supply; Function superior laryngeal; What does it give off; To what is external laryngeal distributed; Function; Other name for inferior laryngeal; Function; Function œsophageal branches; Cardiac; Pulmonary; Gastric; Hepatic and splenic; Vagi supply sensory filaments to what parts; What do they supply to vaso-motor center; To salivary glands; In what animals will division of recurrent laryngeal cause death; Why; Condition of lungs when death is produced by division of vagi; Cause; Trouble if vagi are injured near origin; Other name of eleventh nerve; How many roots; What are they; Origin of each; How get into cranium; Out; Kind nerve; How many branches; What does external supply; Symptom if cut; Stimulated; With what does internal branch unite; Name three symptoms if cut the upper root; Internal branch; What is really the inhibitory nerve of heart; Nerve of voice; From where does it get the fibre necessary for voice; Proof; As regards voice difference in symptoms in cutting upper root of spinal accessory or internal branch; Life; Why; Other name for twelfth nerve; What does it mean; Kind nerve; Origin; How get out; To what distributed; What are its branches; What does descendens noni mean; What supply; Function of hypoglossal; Symptoms if cut.

**PONS VAROLII.**—What does it mean; Function in a general way; Describe and give function of transverse fibre; Longitudinal; Dorsal portion of pons; Name gray matter in fore part.

**CRURA CEREBRI.**—What does it mean; Describe them; Made up of how many parts; Names; What separates them; Where does tegumentum end; Describe course of the fibre of pes; What is corona radiata; What is the internal capsule; Genu; What does it mean; Give distribution of fibres of internal capsules; With what does tegumentum on each side

have to do; Name more important of the gray matter; Give extent of nucleus ruber; Locus niger; Name of third body under optic thalamus; Posteriorly, of what is the tegument made up; What does corpora striata mean; Situated; Parts into which it is divided; Name and describe the intraventricular portion; Extra ventricular; Describe the lenticular nucleus; What does optic thalami mean; Describe them; Name parts that make them up; What does corpora quadrigemina mean; Describe them; What does corpora geniculata mean; Describe them; What does corpora dentata mean; Describe them.

**CEREBRUM.**—What does cerebrum mean; Into how many lobes divided; Give boundaries and describe frontal; Parietal; Temporal; Occipital; Central; What mean by gyri; Sulci; Describe gyrus fornicatus; Marginal convolution; Internal perpendicular fissure; Calcarine; Hippocampus minor; Collateral fissure; Where is gray matter in cerebrum; Function of convolutions; Average thickness of gray matter; Where thickest; Thinnest; Kind cells; Describe the large pyramidal; Small; Other cells; How many layers in cortex; Describe superficial; Second; Which layer most important; Describe it; Describe fourth layer; Last layer; Peculiarity of cells in motor area; Where granular layer most marked; Give composition of nerve matter; Name parts of brain in center from before backwards; Weight of brain in adult man; In what animals is it larger; Relative weight to the body; In what is it larger; Weight of brain in child at birth; Relation to size of body; Weight of brain increases to what age; Decrease; Weight of brain in female; Does brain weight correspond with degree of intelligence; How influenced by convolutions; Weight of spinal cord; Relative weight to brain; Give distinctive characters of human brain; Most distinctive point in human brain as contrasted with ape; Where are motorial areas of human brain located; Give the position of the center; What does de-

struction cause; When; Irritation; With what has aphasia been associated; Why will stimulation of white matter after gray has been removed cause movement; With what are motor fibres connected; From motor area where do they go; Give position of fibres in capsule; Give arrangements of fibres in monkey's brain from above down; Describe fibres of descending degeneration in capsule; Ascending degeneration; What fibres does optic thalamus receive; Describe the fillet; Posterior longitudinal bundles; Superior peduncle of the cerebellum; Fibres from corpora quadrigemina; Commissural fibres.

**FUNCTIONS OF CEREBRUM.**—Name them; Effect of removal of cerebrum in lower animals; Effect of removing cerebral lobes of a frog; Entire brain; Cerebrum from pigeon; Where do all voluntary movements originate; What part of cerebral cortex is sensitive to electrical stimuli; Where are co-ordinate movements represented; Effect of hæmorrhages near corpus striatum; Effect of injury of the pyramidal tracts; Are the impulses that pass down from cortex of necessity connected with consciousness; What will set cortex in motion; Effect of destruction of one cerebral hemisphere.

**SLEEP.**—What is it; What condition might produce same symptoms; Condition of brain during sleep; For what two purposes does blood go to brain; During sleep for what purpose; Give mechanism of cerebrum during dreams; Somnambulism; Where are co-ordinating centers situated; From where do impulses that influence co-ordination come.

**SENSORY CENTERS.**—How is the termination of optic nerves in retina arranged; Give example; Where do optic nerves decussate; Give arrangements of fibres; Describe arcuate commissure; Give termination of optic tract; Effect on nuclei of removing eye; Describe fibres of optic radiation; Symptoms if divide one optic nerve; Optic tract; Names; Function of cuneus; In reality what are the olfactory



nerves: From what is it an off-shoot: What fills cavity of nerve: On what does nerve rest: Give structure of bulb: Nuclear layer: Where are the glomeruli: Describe olfactory tract: Where have fibres been traced: Why think hippocampus is connected with smell: Where taste center situated: Location of auditory center: Why: Function of corpora striata: Optic thalami.

**CEREBELLUM.** — What does it mean: How hemispheres connected: How connected with cerebrum: Medulla oblongata: Where is gray matter in cerebellum: White: Where find corpus dentatum: What find beneath pia mater: Describe cells of Purkinje: Granular layer: Nerve fibre layer: Function of cerebellum: Function of corpora quadrygemina and geniculata.

**SYMPATHETIC SYSTEM.** — Is the sympathetic system separate and distinct from cerebro-spinal: Of what does it consist: What mean by lateral ganglia: Collateral ganglia: Terminal ganglia: Give communication of spinal nerve with sympathetic: With what do the white rami from second to fifth join: Give distribution of gray rami: Which are visceral branches: Peculiarity in structure of these white medullated fibres: Where chiefly found: What forms nervi erigentes: Give distribution of hypogastric plexus: What is pelvic splanchnic: Cervical splanchnic: What are the splanchnics proper: What forms the internal branch of the spinal accessory: Function of the efferent fibres to vascular system: Viscera: Muscles: Whence do vaso-motor nerves for all parts of body come: With what pass out: From what part of cord: To what pass: Change undergo: Origin of augmentor nerve of heart: Give course: Origin of vaso-motor of the brachial plexus: Where do those to the foot leave cord: Give course: What do nerves lose in ganglia: Origin of vaso-motor nerve to head, neck, and abdomen: Name of lateral sympathetic chain: What mean by vaso-motor dilator: Origin:

Give origin of visceromotor fibres; Distribution; Function; Name visceroinhibitory fibres; Other name; Function; Give arrangement of glandular nerve fibres; Origin of the rami viscerales; What nerve arise from anterior cornua; Origin nerves to striated splanchnic muscles; What arises from Clark's column; Posterior cornua; Lateral cornua; Give structure of ganglia; Function; What mean by catabolic; Anabolic; Name catabolic nerve to submaxillary gland; Effect if stimulated; Name anabolic; Effect if stimulated.

**SENSES.**—How do we obtain a knowledge of various parts of body and external world; On what is this knowledge based; Structure necessary for sensation; How sensations classified; What mean by common sensations; Which come under head of pain; What is the connecting link between general and special sensation; Function of muscular sensibility; Organ in which sense of contact and pressure reside; Name special senses; Most important distinction between common and special sensations; Illustrate; Can we recognize the object which caused it or its nature by pain; Where is the seat of sensation; Where do we really see and hear; What mean by objective sensation; Subjective; What mean by auditory spectra; Example; Optical illusion; Example; Internal cause of illusions; Effect of a narcotic on each sense; External cause of illusions; Have nerves of special sense common sensibility; What mean by perceptions; Judgments.

**TOUCH.**—Seat; Where sense of touch most perfect; On what does modification of sense of touch depend; Varieties of touch; Where touch proper located; What dulls it; Where are touch corpuscles; End bulbs; Corpuscles of Vater; Other terminations of sensory nerves; When can we not distinguish between contact and touch; On what does acuteness of sensation largely depend; Other cause; How influenced by practice; Illustration; How localize sense of touch; Give illusion in sense of touch; Give example illus-

trating difference between sense of touch and sense of temperature; Standard for estimating sense of heat or cold; Why will metal feel cooler than wood at the same temperature; Which feel coolest, air at rest or in motion; Sensation experienced by high or low temperature; How does extent of surface influence it; Thickness of skin; What attends every sensation; Does the mind retain it; On what do subjective sensations depend; Give example; Give three views of painful sensations; On what is estimation of weight based; Do muscles have common sensibility; What do they contain; How tell form and size of bodies; Where best developed; Part best adapted.

**TASTE.**—Conditions necessary; Mode of action of the substance that causes taste; Condition of the matter to be tasted; Conditions for perfect action of a sapid; What will excite nerves of taste; Seat of sense of taste; Other parts endowed with it; What nerve supplies these parts; Where taste most acute; Why is dorsum feebly endowed with it; Other functions of tongue; May taste be lost and sensibility retained; Relation of papillæ and nerve supply of both; Example; Can we always distinguish between general sensibility and sense of taste; To what is the perfection of sense of taste due; Give variety of tastes; How do away with sweet and bitter; When are sweets most appreciated; Bitter; What are taste buds; How does taste resemble vision; What mean by after-taste; What taste will improve that of wine; Destroy it; Repetition of taste has what effect on it; What is necessary for sapid substance to cause distinct sensation of taste; What mean by subjective sense of taste; Cause that produces it.

**SMELL.**—Conditions necessary for it; Can liquids give rise to sense of smell; What mean by regio vestibularis; What does it contain; What does regio respiratoria include; Kind epithelium does it contain; What is regio olfactoria; Describe the mucous membrane; Epithelium; Second kind epithelium; Glands;

Peculiarity of olfactory nerves; How terminate; From what parts is sense of smell derived; Do the accessory cavities have anything to do with sense of smell; Proof; Function of the cavities; Give other functions of nasal cavities; What excites sensations in nose that resemble sense of touch; Carnivora detect especially what odors; Herbivora: How does man compare with inferior animals as regards sense of smell; Cause of difference; Give illustration of some subjective sensations of smell.

**HEARING.** Name three divisions of ear; Which are accessory; Give anatomy of external ear; Middle ear; Internal ear; What nerve supplies ear; What does *portio mollis* mean; Where arise; How get into ear; How many branches; What does superior supply; Inferior; What is *maculæ acusticæ*; *Crista acustica*; Give structure of the membranous labyrinth; Describe the epithelium; What mean by *scala vestibula*; *Scala tympani*; Where find rods of Corti; Describe them; Number; What are hair cells; Viewed from above, what do organ of Corti resemble; Describe the distribution of cochlear nerve; Name three ways external auditory passages influence the propagation of sound to the tympanum; Function of cartilage of external ear; How are vibrations conveyed to auditory nerve in animals living in the atmosphere; How does *membrana tympani* differ from the membrane of a drum; How would hearing be affected by making *membrana tympani* tense; How prove air enters eustachian tube; Function of the tube; Function of *tensor tympani* muscle; *Stapedius*; Fluid of labyrinth; *Otoliths*; What are they; Function semi-circular canal; *Cochlea*; *Rods of Corti*.

**SOUNDS.**—What mean by musical sound or tone; Name three qualities by which musical sounds can be distinguished from each other; What mean by strength; Pitch; Timbre; Harmonics; How tell direction of sound; Distance; Intensity; Binaural sensations; Cause of subjective sounds.

**SIGHT.**—Give anatomy of the eye; Name the several parts composing the optical apparatus; In what way does eye resemble a camera; Name the refractive media and surfaces; What rays are not refracted; What rays meet at chief posterior focus; What mean by chief anterior focus; Optic axis; Upon what do images formed upon the retina depend; Trouble if the focus occurs in front or behind retina; What mean by focal distance; To what is adaptation of the eye to objects at different distances due; When lens most convex; Which surface most convex during accommodation; Give experiment; Give mechanism of accommodation; Distance eye is usually focused; What mean by near point; How determine; Two changes that take place in eyes in accommodation; What muscles turn eye in; Out; Upward; Downward; Inward and upward; Inward and downward; Outward and upward; Outward and downward; What nerve supplies the above muscles; What will cause pupil to contract; Dilate; Where centre situated that causes pupil to contract; How is the centre stimulated; What will produce contraction and dilatation locally; Action of fifth nerve on pupil; From what does sympathetic influence to the radiating fibres come; How is normal eye adjusted; How do we view near objects; What is myopia; Hypermetropia; Astigmatism; Spherical aberration; Chromatic aberration; In what is eye superior to camera; What is presbyopia; What layer of retina will react to a stimulus; What mean by blind spot; How make both dot and cross visible; Where light produce the greatest effect; Most important cones or rods; What is Purkinje's figure; Cause of yellow spot; To what are the vessels distributed; Give duration of visual sensation; Give intensity of visual sensation; Give Fechner's law; Why can't we see fundus of eye; How is this difficulty surmounted; What is rhodopsin; Optogram; How caused; What is chromophauss; Cause fusen granules to move; Cones; Relation of the retinal image

to the external object: On what does the field of vision depend: When is it small; Large; On what is our estimation of size based; Direction: Form; Clearness; How estimate movement; Color sensations; Name primary colors: What is Daltonism; Cause: Necessary condition for the production of contracted colors; What mean by binocular vision; How do we usually see; What is diplopia; Cause: Effect of pressing on the ball of the eye so as to affect the retina; Why do impression on the identical points of the two retinae give rise to one sensation.

### GENITAL ORGANS OF THE FEMALE

Of what do they consist; Give the anatomy of the ovaries; What does ovary mean; Give structure; What does tunica albuginea mean; Graafian follicles; Ovisacs; Membrana granulosa; Ovum; Germinal vesicle; Germinal spot; Zona vasculosa; Discus proligerus; Liquor folliculi; Membrana vasculosa; Size ovum; Name external investment; What mean by vitellus; Other name; Germinal vesicles largest in what ova; Where germinal spot situated; How Graafian follicles formed; When smallest formed; What make-up; When Graafian vesicles formed; Change they undergo at puberty; What mean by oviducts; Other name; Give the anatomy; What does uterus mean; Give anatomy; Name three layers making it up; Describe the external; Middle: When best developed; Describe mucous coat; What mean by palmæplicata; Name the glands; Describe them; Thickness of mucous membrane of the cavity; Kind epithelium covers it; Shape of cavity; What does vagina mean; Describe it; What is sphincter vaginae; Hymen; Clitoris; Describe the external organs of generation; Where find the vulvo-vaginal glands: To what do they correspond.

### GENITAL ORGANS OF THE MALE.

Name them; Describe testes; Vas deferense; Epididymis; Tubuli seminiferi; Vesiculae seminales; Give the anatomy of penis; Urethra; Give structure of

corpora cavernosa; Spongiosum; Give nerve supply; What does prostate mean; Give anatomy; Structure.

**PHYSIOLOGY OF THE SEXUAL ORGANS.**—Where is Graafian vesicle when ripe; Change in vesicle; What becomes of contents; When does this occur; When are ova discharged; How indicated in lower animals; Human female; When does this discharge occur in lower mammalia; When discharged in women; Give evidence of periodical discharge of ova at menstrual period; Is menstruation dependent on the maturation and discharge of ova; As regards menstruation, when do follicles rupture; Name Jewish custom; Relation of menstruation to ovaries; Describe the menstrual blood; Source of the blood; What is decidua menstrualis; What is puberty; Average time; On what does it depend; Name of cessation of menstruation; Time of menstrual period; What mean by corpus luteum; Changes in follicle before bursting; Change after rupture; How does human corpus luteum differ from lower animals; Cause of this yellow substance of which the corpus luteum consists; Change in corpus luteum if ovum is impregnated; Give difference between corpus luteum of menstruation and pregnancy; In what way can ovum be fecundated; How; What mean by seminal fluid; Describe semen; Spermatozoa; Cause of movement; What will stop ciliated movement; Shape of head in man; Give make-up of a spermatozoon; What are spermatozoa; When seminal fluid secreted; Where stored up; How discharged; Function vesiculae seminales; Function of secretion of Cowper's glands.

**CHANGES WHICH OCCUR IN THE OVUM.**—Primary change in ovum before impregnation; Next change; What forms nuclear spindle; Polar cell; Female pro-nucleus; What forms male pro-nucleus; What forms blasto-sphere; Changes ovum undergoes in Fallopian tube; First visible result of fertilization; When does segmentation begin; What



mean by vitelline spheres; Appearance of ovum time it reaches uterus; What are these granules; Time ovum is going from ovary to uterus; What is blastoderm; How formed; Divides into what layers; What does each form; What is area pellucida; Area opaca; Nucleus of Pander; Embryonic shield; Primitive streak; Primitive groove; From what is streak formed; What is notochord; Medullary plate; Medullary folds; Laminæ dorsales; Neural canal; Sinus rhomboidalis; Germinal wall; What forms parietes of trunk; Muscular walls of alimentary canal; What is somatopleure; Splanchnopleure; Pleuro-peritoneal cavity; Protovertebræ; First vertebræ formed; Of what does every vertebrate animal consist; What mean by visceral plates; What do they form; What forms rudiment of alimentary canal; How does it communicate with cavity of yolk sac; What is umbilical vesicle; Neurenteric canal; Optic vesicle; Where is heart formed; What does it resemble; What is mesocardium; What nourishes foetus at first; What mean by area vasculosa; What does amnion mean; How formed; What mean by amniotic umbilicus; What forms true amnion; False chorion; What is amniotic cavity; Amniotic fluid; Describe the fluid; Function; From where does allantois sprout; Shape at first; Change it undergoes by development; To what are the blood vessels distributed that are carried out by allantois; How allantois divided at umbilicus; What becomes of outer; Inner; What forms urachus; What does chorion mean; How many layer has it; Name them; What are chorion villi; What are they at first; Afterwards; Where don't villi disappear; Name changes which occur in mucous membrane of uterus at conception; Function; What becomes of the impregnated ovum as it enters uterus; What does decidua mean; What is decidua vera; Reflexa; Serotina; What are uterine crypts; What becomes of decidua vera and reflexa; What does placenta mean; How uterine sinuses formed; With what do they com-

municate; Function; Do blood vessels of mother and foetus communicate; What intervenes; What separates them in villi; Function of this; What are the parts that make up placenta; What is the after-birth; What is the lochia; What mean by umbilical cord; Describe it.

#### **DEVELOPMENT OF THE ORGANS.—**

What does epiblast form; Mesoblast; Hypoblast; What forms the vertebræ; What is musculo-cutaneous plate; What does it form; Where does ossification of vertebræ begin; Peculiarity of lower cervical vertebræ in the child; What is the cranium; How is pituitary body formed; How is cranium developed; How are the extremities developed; Name of first blood vessels; Length of foetus; How are red corpuscles formed; How blood vessels formed; Where heart begins to develop; Condition of heart when first formed; When do pulsations begin; How often at first; Peculiarity of auricles; Ventricles; How arteries developed; Capillaries; Explain the development of aorta; Pulmonary artery; Ductus arteriosus; Peculiarity of umbilical arteries; How are the veins divided; What does visceral include; Parietal; Name of the earliest veins; How many sets of vessels in liver; Names; Name venous blood to liver.

**NERVOUS SYSTEM.**—How are cranial and spinal nerves developed; Spinal cord; Peculiarity of cord at first as regards its length; How is brain developed; Explain the development of the eye; Ear; Nose; Alimentary canal; Pancreas and salivary glands; Liver; Lungs; What form temporary kidneys; When does Wolffian duct make its appearance; What is developed from the germ epithelium; Where are permanent kidneys developed; What forms testicle; Where; When begin to descend; When get into scrotum; What pulls them down; From what are Fallopian tubes, uterus and vagina, developed; What form external organs of generation in female; Male.



